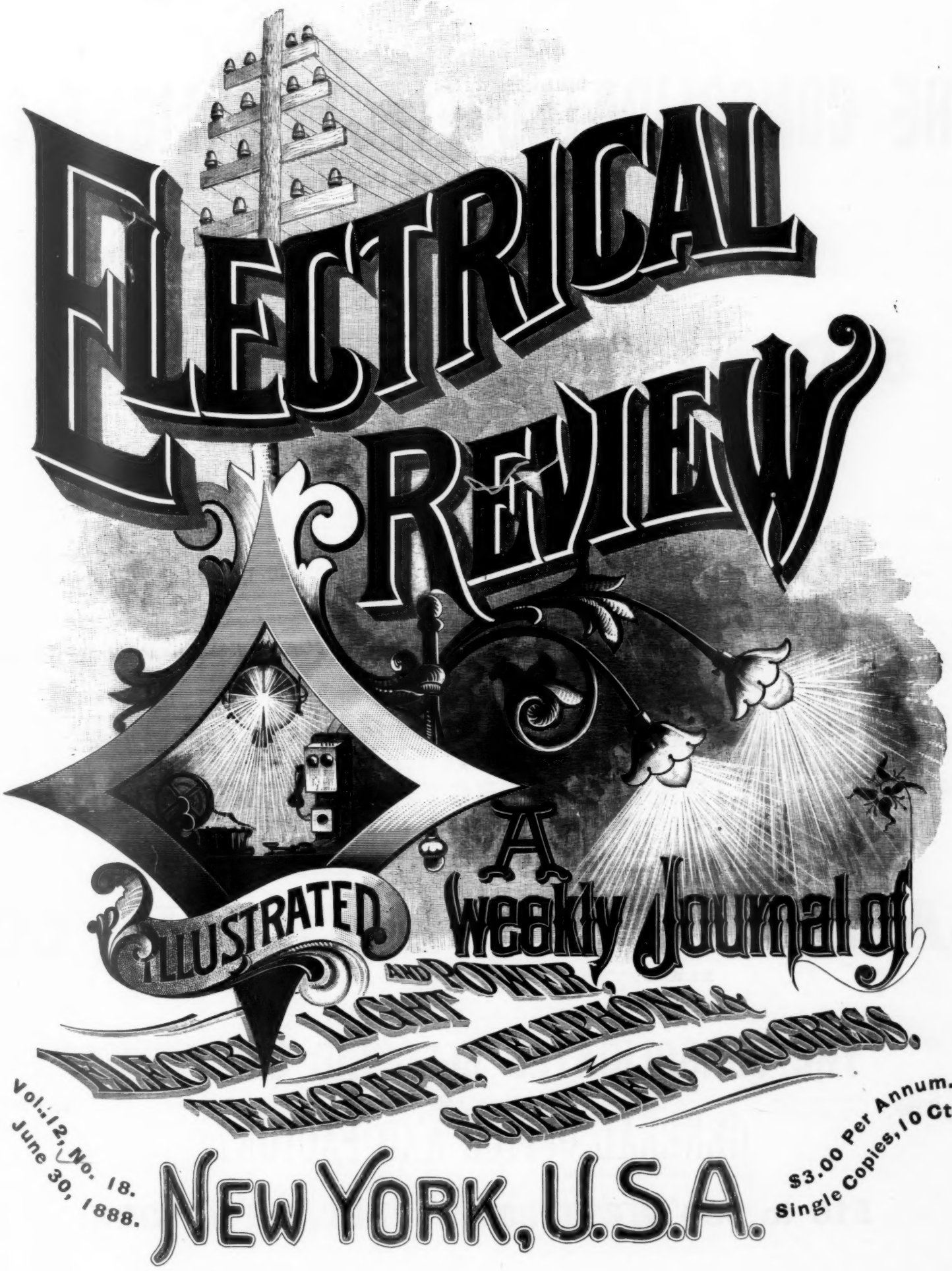

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ELECTRICAL REVIEW

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A WEEKLY JOURNAL OF

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The Tesla Motor.

TO THE EDITOR OF ELECTRICAL REVIEW:

I desire to call your attention to an interesting statement to the effect that Tesla's alternating current motor is anticipated by Varley's automatic electric clock system in operation in the Royal Institution, London, England, as I am advised. I am informed by a prominent English electrician, that the Standard Clock has a bob carrying a bobbin which, as the pendulum vibrates, is carried back and forth over permanent magnets, thus generating alternating currents at each of its vibrations. The outlying local clocks are connected by wires through the bobbin circuit of the pendulum, and the motors of these clocks are constructed in almost identically the same manner as those covered by Tesla's inventions. I give you this for what it is worth, and you are at liberty to use it in your journal if you desire.

Very truly yours,

New York, June 20. C. J. KINTNER.

We fail to see the anticipation. Tesla's motor depends upon two separate currents, differing in phase by one-quarter period, and a pendulum bob is hardly capable of generating that particular kind of currents. It is more likely to be a step-by-step motor at the outlying clocks operated by the reversal of the generated currents. However, in the absence of details from our correspondent, only guesses can be made.

A Telegrapher's Yarn.

The old time telegraph operator has had about as varied an experience with men and things as anybody you will find. He comes next to the roving typesetter in that regard. I ran across one of the real old kind the other day, says a correspondent. He is at present engaged in the operating room of the Western Union, but in his time has held positions of trust and responsibility, and been all over the land. Of course, he is a great sport—he wouldn't be an old-timer of any description if he wasn't, and has won and lost fortunes at card-playing and horse races. Among other yarns he told me one about an experience he had on a Mississippi river steamboat which is unique.

"I fell in with two or three planters one time," he said, "and of course it wasn't very long before we were 'sitting in' at a nice little poker game. It was a walk-over for me, and it wasn't very long before I had taken away all the loose money they had about them. Then they got the notion somewhere that I had been 'handling' them, though I had been playing a square game all through. They tried to intimidate me and make me give up my winnings, but it was a failure, and when they became thoroughly convinced of that they just collared me and bundled me down into the engine-room and tied me up to the piston-rod of the engine to make me confess. You see, they wouldn't take the money away from me, their queer ideas of honor wouldn't allow them to do that—but if they could torture me into giving up, why it was all right. Well, they tied me up so I had to keep walking back and forth as the piston-rod churned away. They left me there about three hours, and I had to keep up that two-steps-forward-and-two-steps-back till I thought I would die. If I let go a second the piston-rod would jerk the life out of me. Finally they came down and took a look at me.

"'Will you give up that money now?' they asked.

"'Go 'way, you,' I said, 'go 'way; you make me lose my step.'

"Well, sir, they had a quiet laugh and turned me loose and told me they thought I was square."

The Electric Road Pleases Pittsburgh.

For years the idea of the substitution of electricity in the place of horse flesh as a power for street railway locomotion has been discussed on paper and shown in models. As long ago as 1854, the writer remembers, says the Pittsburgh *Chronicle-Telegraph*, to have seen exhibited in a country school-house in Maryland, by an itinerant lecturer, the toy model of an electric railway, in which, as memory serves, something very like the present successful overhead circuit system was employed in propelling the miniature cars. Then the knowledge of the power and value of the subtle fluid was limited to a few. The telegraph was then in its infancy—less than ten years old—and no one dreamed that an electric railway was possible on a practicable scale. But it has come, and Allegheny City has a road that is a success beyond all question, and has been so pronounced by experts from all parts of the country. It combines both the overhead and the underground systems, and performs wonders on heavy grades. It gives a higher rate of speed than can be attained on the cable lines, and is much more cheaply constructed and operated. From present indications, five or ten years hence will see no more horses in use for propelling street cars. Already many electric roads are in operation in different parts of the country, and many of the old style are contemplating changing to that form of propulsion. It looks as if electricity was destined to be yearly developed into new forms of service for mankind, and finally furnish us with heat, power and light.

Electric Night Signals at Sea.

The ELECTRICAL REVIEW, referring in its latest issue to the system of night signals by incandescent electric lights, recently adopted by the German and Italian navies, says: "It is self-evident that this system could be used by mail steamers, and if the international conference urged by the New York *Herald*, and provided for by the Belmont bill, should require vessels to have a signal to indicate their course, a definite combination could be kept displayed by this means which would be readily understood by the commercial code."

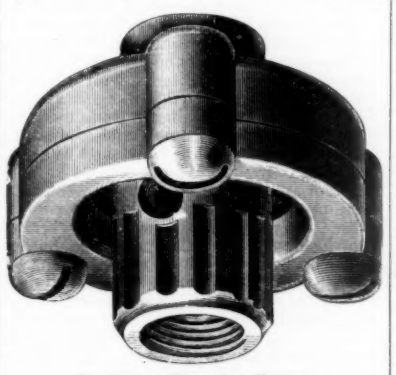
The REVIEW's suggestion is entirely practicable. The system of electric night signals is adapted for the general naval signal book and telegraphic dictionary, just as the flag numerals and the international day signals. Long messages can be spelled out by the electric signals at night, and are easily understood. The visibility of these signals is insured by placing the electric lamps in three lanterns hoisted at the masthead, and the lights are displayed by means of a switchboard to open and close the circuit through the combination of lights to make any desired signal.

As the new system would greatly enhance the safety of navigation, and it would cost nothing to operate it on board the many steamers which carry an incandescent electric lighting plant, it should be promptly utilized by the great steamship lines.—*New York Herald.*

A New Joint for Electric Fixtures.

The insulating joint, of which we give an illustration this week, has recently been put on the market by the E. P. Gleason Manufacturing Company, and by its construction and weight, is made to overcome defects peculiar to fittings used for insulating purposes.

It is unlike in construction any other we have seen, being neither a union, nor a pair of insulated flanges, but it is what might be called a cupped flange, which embraces a flanged nipple, forming a body in which the insulation is enclosed; the whole is assembled and securely held by from three to eight steel screws,—¼ to $\frac{5}{16}$ thick—according



ELECTRIC FIXTURE JOINT.

size; which screws pass through and enter into solid metal, in no place coming in contact with the insulation.

The inner insulation is impervious to gas and its accompanying moisture; the outer insulation is a washer of vulcanized fibre, which does not come in contact with the gas, hence no moisture is absorbed by it; for steam rooms and in breweries, pure gum washers have been substituted. It is claimed that this fitting cannot be twisted, strained, short-circuited, or injured in ordinary use, and we have heard of its having resisted a current of 1,004 volts, 9.6 amperes, without sparking, jumping, or burning out.

These fittings are made in all sizes, for combination fixtures or electric light only. The various boards of fire underwriters sanction the use of these fittings, of which the E. P. Gleason Manufacturing Company are the sole manufacturers.

The Lightning Rod.

A lightning rod manufacturer, who is one of the largest producers of the article in the United States, in speaking of his industry, says:

"No," said he, "it is not true that the demand for the rods is falling off. The business this spring is not quite as lively as at this time last year, but the season is a little late. It is all nonsense to deny the value of lightning rods as a protection for buildings. I think that has been established long ago. Electricians may theorize upon the subject, but that does not count much against the practical test of their utility. Much of the prejudice existing against the rods is due to the poor workmanship in setting them up. In such cases the rods get the blame very unjustly. Every one knows the principle on which a lightning rod works. It is composed of iron or copper, or a combination of both these metals. They are good conductors of the electric current, and draw it down to the earth when it comes dangerously close to a building. There are about forty varieties of the rod, the copper being the best, as that metal is the best conductor. Here is another cause for prejudice against the rods. A man puts up one rod at the end of the barn, for instance, takes no care of it whatever, and then expects that one rod to watch over the entire heavens for him. To secure protection for a large structure there should be a circuit of lightning rod, all connecting and all with good ground contact in moist earth. Destroy the conditions of anything good and you wipe out its effectiveness. It is a fact that first-class architects in this city include in their plans the lightning rod circuit. The agents are not connected with the manufacturers other than as purchasers of the rods on their own account. Glass was formerly used almost exclusively as an insulator, but now we fasten the rods to the sides of buildings with iron clamps. Great care is exercised in the manufacture of the rods, and they are made in the most scientific manner possible."

Committees of The Electric Club, New York.

The committees of the Club have been appointed for the year and are composed of the following named gentlemen:

House Committee—Theo. N. Vail, chairman; Cyrus O. Baker, Jr., H. L. Storke, John C. Tomlinson, A. H. Patterson.

Entertainment Committee—E. T. Gilliland, chairman; Leonard E. Curtis, Chas. W. Price, Chas. W. Gould, Dr. Otto A. Moses.

Reception Committee—George Worthington, chairman; Geo. M. Phelps, M. T. Davidson, H. R. Garden, W. S. Hine, Frank Stone, Geo. F. Porter, C. H. Barney, Jas. W. Godfrey, Chas. Dutton, M. M. M. Slattery, Jas. Kempster, Lieut. F. W. Toppan, U. S. N., George Parson Lathrop, W. S. Perry, W. H. Baker, S. A. Duncan, and Frank Ridlon.

Committee on Welfare of the Club—Chas. Dutton, chairman; Geo. L. Philips, Chicago; John W. Beane, New York; T. B. Doolittle, Bridgeport, Conn.; John I. Sabin, San Francisco; A. J. DeCamp, Philadelphia; A. V. Garratt, Boston; and James English, New Haven.

Electrical Committee—J. C. Chamberlain, chairman; Thos. P. Conant, and Albert Taylor.

Suing the Western Union Co.

Suits for various sums aggregating about $40,000 have been instituted by City Solicitor Warwick, Philadelphia, on behalf of the city against the Western Union Telegraph Company in Court of Common Pleas.

This is the beginning of a litigation which the telegraph company proposes to fight through all the courts from the Common Pleas of this county to the United States Supreme Court. The claim of the city is for the license fees for telegraph poles in the City of Philadelphia for the years 1884, 1885, 1886, 1887 and 1888. The ordinance of Councils fixes the annual license fee at $5 per pole, and it is estimated that the claims for these annual license fees will average $8,000 for each of these years.

A similar suit was brought in Court of Common Pleas No. 2, in the year 1883, against the Western Union, Mutual Union, Commercial Union and the Atlantic and Pacific Telegraph Companies for the same license. In those suits the city won.

*The Electrical Distribution of Time.

By ALLAN D. BROWN, Commander, U. S. Navy, Assistant Superintendent of the Naval Observatory, Washington.

The subject upon which I have the honor to address you this evening is the Electrical Distribution of Time. Leaving out of consideration the question as to what Time is, what its measure and how obtained—questions the answers to which would of themselves serve as a subject for an evening's lecture—I will pass at once to a definition of the title which has been chosen for this address. By this title is understood the causing of the instant shown by a timepiece at a central station to be marked by some apparatus prepared to receive the necessary signal at another station in electrical connection with such central station.

If the apparatus at the receiving station is in the nature of a timekeeper, its operation must be automatic; and to secure the highest possible accuracy, the action of the central timepiece must likewise be automatic. In its best form, then, our title may be said to mean the automatic electrical synchronization of one or more clocks by a clock at the central station; with this synchronization may also be associated the registering of the signal upon a chronograph, the ticking of a telegraphic instrument, the firing of a gun, the ringing of a bell, the discharge of a flashing signal, or the dropping of a time ball; in a complete system any or all of these means will be used according to the circumstances of the case under consideration. It is essential, to insure the highest order of accuracy, that the central station shall always be at an astronomical observatory, and preferably at one which is able to devote the services of one or more persons to this special duty. Such work is known briefly as a time service, and its signals as time signals. A brief historical review of the evolution of the time service of to-day will not, it is hoped, prove uninteresting.

As early as 1816, one Ronalds, an Englishman, invented a telegraph which was so dependent upon time pieces for its working, that it may be said to have been a device for the temporal distribution of electricity. He connected two clocks with some 500 feet of insulated copper wire; upon the seconds arbor of each clock was placed a circular plate of brass, the circumference of which was divided into 20 equal parts, the chief letters of the alphabet and a double series of numbers up to 10 being placed in these divisions. In front of this was a second plate in which was an opening through which one letter and figure were visible; in front of this latter plate was suspended a pith-ball electro-meter connected with the wire between the two clocks and also with a frictional electric machine; this apparatus was in duplicate, one for each end of the line. An electrical pistol was also in circuit when the apparatus was not in use, so that by its discharge the attention of the attendant would be attracted when desired. The manner of using this telegraph was as follows: The clocks were first supposed to be accurately synchronized, so that the same letter would appear at the same instant in both plates; the machine was turned, and by the electricity thus generated, the pistol at the other end of the line was discharged; the attendant in reply made a signal previously agreed upon, by waiting until this pre-arranged letter was in sight, and then turning his machine, when the charge would cause the pith-balls of the electro-meter to diverge at both stations; the first operator would cause the discharge of the machine by a touch, the pith-balls would fall together; the message would then be sent in like manner, as each letter came in sight through the hole in the upper plate, the receiver noting each letter as the balls fell. There were two difficulties in the way of the use of this plan; (1) that of obtaining a current at all times; (2) the fact that it would be impossible to keep the two clocks always exactly together; this, however, could easily have been gotten over, as the sender could signal when a certain letter was visible, and the receiver noting the one he saw could then tell how much his clock was out of the way. In effect this was the first attempt at telegraghic time signals, and for this reason only is it here referred to.

In 1833, the German mathematician, Gauss, associated with Weber, erected a line of telegraph some five miles in length, connecting the astronomical and magnetic observatories in Gottingen with various other stations. He obtained his current from a crude form of magneto-electric or dynamo machine, and the whole apparatus was of a very unwieldy character; a flattened coil containing some 30,000 feet of iron wire, had suspended within its center a magnetized bar weighing some 30 pounds; upon the suspending wire was arranged a mirror in which was reflected a scale, the latter being viewed through a magnifying glass.

The dynamo had a pole changer, so that the current could be sent in either a positive or a negative direction, and thus the bar be deflected either to the right or the left, at the will of the operator; by a combination of these deflections a message could be spelled out. By this apparatus, as I have gathered, comparisons of clocks were actually made, and to these gentlemen is therefore due the honor of sending the first telegraphic time signals. Although no particulars of the way in which this time service was operated are on record, it may easily by surmised that the method was somewhat as follows: Probably the hour selected for the signal was noon; two or three minutes before that hour, by the standard clock, a signal would be sent over the line; as the hands of the clock marked the exact hour, one distinct deflection of the bar would be made, at which instant the receiver would note the time shown by his clock; subsequently ascertaining the error of the standard, that of the other would readily be deduced.

In 1840, Mr. Charles Wheatstone announced the invention of an apparatus "enabling a single clock to indicate the same time in as many different places, distant from each other, as might be required." He proposed to accomplish this object by connecting electrically a standard clock with his *electro-magnetic clock*, which latter consisted "simply of a face with its second, minute and hour hands, and of a train of wheels which communicated motive-power from the arbor of the second hand to that of the hour hand in the same manner as in an ordinary clock train;" a small electro-magnet was caused to act upon a peculiarly-constructed wheel placed on the seconds arbor, in such manner that whenever the temporary magnetism was either produced or destroyed, the wheel (and consequently the second hand) advanced the sixtieth part of its revolution. On the axis of the scape wheel of the primary clock was placed a small disc of brass, which was first divided into sixty equal parts; each alternate division was then cut out and filled with wood, so that the circumference consisted of thirty alternations of wood and metal. A very light brass spring was secured to an insulator attached to the clock frame, its free end pressing upon the circumference of the disc; connection having been made between the insulated end of the spring and one end of the wire with which the electro magnet was wound, the circuit was completed by the other end of the wire being connected to the clock frame through a battery; the primary clock being running, it followed that the circuit was made and broken each alternate second, while the distant dial recorded the advance of its wheel in unison with that of the parent clock. This is practically the same thing as the socalled electric time system of the present day, and it was the first attempt at the distribution of time by electricity. It had the defect common to all such systems, of being applicable to only a limited space, and in addition it was subject to the same trouble that besets everyone who proposes to rely upon electricity derived from a battery as a motive-power for any sort of machinery; accidents *will* occur, and a system of time distribution on this plan an accident is fatal to precision.

The completion of the Morse telegraph between Washington and Baltimore, in May, 1844, afforded the means for the next step in the evolution of our subject, and for this we are indebted to a naval officer, Commander Wilkes (afterward Rear Admiral), who, associated with Lieutenant Eld, transmitted time signals between the two cities. So keen was Wilkes in this matter, and so alive to its importance, that although the telegraph was not completed until the 27th of May, yet, on the 9th of June, Wilkes was exchanging his first signals, completing his work on the 12th. He used two chronometers, each rated to local time, and thus ascertained the difference of time between the two cities, and hence the difference in their longitude; his determination of this difference was only 3-100 second from that subsequently determined by the Coast Survey when more accurate methods had been devised.

Two years later, in October, 1846, time signals were exchanged between the Naval Observatory, in Washington, and the Observatory of the Central High School, in Philadelphia, this being the first use of what has since come to be known as the American telegraphic method of determining differences of longitude. This work was planned under the Coast Survey by Mr. Sears C. Walker, an assistant in that office. The observations were made by Prof. Kendall, in Philadelphia, and Lieutenant Almy, in Washington.

In July and August, 1848, signals were exchanged between the observatory of Harvard College and a private observatory in New York. During this work, Prof. Bond, of Harvard, conceived the idea of an automatic circuit interrupter to be worked by the clock used in the observation. He communicated his ideas to the Superintendent of the Coast Survey, and by him was authorized to construct a clock after his plans. This work was not finished until some time in 1850.

In the meantime Mr. Walker, in conversation with Prof. O. M. Mitchell and Dr. John Locke, of Cincinnati, had told them what the Survey desired in the way of an automatic registration apparatus. Both these gentlemen set at work, and Mitchell devised an apparatus which was finally completed in February, 1849. Locke busied himself in the same direction, and twelve days after his talk with Walker he had perfected his apparatus. In this each of the sixty teeth of a wheel on the seconds arbor of a clock struck the arm of a tilt hammer. When the tooth was in a horizontal position, the other arm of the hammer fell upon a bed of platinum, which was in connection with one pole of a battery, while the fulcrum on which it moved was in connection with the other pole. The circuit was then broken and made at each rising and falling of the hammer. The next step was to connect the clock with some form of registering apparatus, and for this purpose the ordinary Morse register, with its continuous fillet of paper, was used. On the 17th of November, a little more than three weeks after the idea was first suggested to him, Locke had in operation his clock registering its beats over the entire line between Cincinnati and Pittsburgh, a distance of more than 400 miles.

This was the first instance in which time signals were delivered *automatically*, by telegraph. As the fillet of paper passed through the register, a continuous record of the seconds was made, with nothing, however, to indicate the beginning of the several minutes; this indication was accomplished by the use of a break circuit key which the observer held in his hand, and pressing at the sixtieth second of each minute, caused the registration to cease for three or five seconds, as might be desired, thus marking the beginning of the minutes. Presumably Locke was engaged during the following six weeks in perfecting his invention, for it was not until December 30th that he announced to Lieutenant Maury, the superintendent of the Naval Observatory, what he had accomplished, and offering it not only for the telegraphic determination of longitudes, but also "as useful in a local observatory as a faithful and convenient register of observations." On the 5th of January, 1849, Maury replied in substance as follows: "I regard it as one of the most important inventions of the age. Feelings of professional pride give additional zest and warmth to these congratulations. For ages the problem of longitude has occupied the mind of wise men, and commanded the attention of governments. This discovery of yours is the crowning work in the great problem. Permit me to claim this high honor first for my country, and next for the navy. An American naval officer, Captain Wilkes, was the first to apply the magnetic telegraph to the practical determination of longitude. It greatly lessened labor and refined results. The next and last step has been made by yourself, who also are an ex-officer of the navy. You have, by your invention, eliminated from the problem the errors arising from comparing the face of one clock with that of another, and made it as easy and practicable to divide seconds into hundredths, as before it was to divide minutes into seconds. By your invention you enable the astronomer to make the ticks of his clock here in Washington to be heard wherever the telegraph leads, and you make the clock to divide those seconds into hundredths."

On the same day he addressed a letter to the Secretary of the Navy, informing him of Locke's invention, and recommending it in the highest terms. This letter was made public, and after some further correspondence it was followed by an invitation from the Secretary to Locke to come to Washington; the subject of an appropriation was discussed, and after much push on Maury's part, the sum of $10,000 was put in the naval bill by the House, for the purchase of a clock on Locke's plan; this came very near being lost in the Senate, but it was saved by the exertions of the friends of the measure, and became a law on the 3d of March. By the provisions of the act the clock was to be erected at the Naval Observatory. This was done, and on the 7th of December, 1849, the clock, with the chronograph attachment was used for the first time, and proved to be a great advance over the old method, although there was still some difficulty in the matter of accurate registration.

As before stated, in 1850, Professor Bond, of Harvard Observatory, completed his clock for the Coast Survey, and in addition, invented an improved chronograph in which the paper was placed upon a revolving cylinder, the driving power of which was so adjusted as to cause one revolution per minute to be made, the record being made by a pen in a continuous spiral line; but as in Locke's plan of the Morse fillet, there was no means of noting the beginning of each minute automatically. About the same time the cylindrical form was under consideration at Washington, but there were some difficulties which it does not appear were surmounted at this date.

In 1851, the Bond chronograph, with its ingenious driving machinery known as the spring governor, was taken to England, and there exhibited, eliciting much commendation, and receiving a gold medal at the Great Exhibition of that year. The Astronomer Royal, of the Greenwich Observatory, in his report for June, 1851, states that he has adopted the plan of "making a galvanic register of transits in the American manner," but the cylindrical chronograph was not adopted until some three years later—a suggestion by Maury during a visit to Greenwich having enabled Sir George Airy to overcome the practical difficulties which were encountered.

During this same year, the observatory at Harvard was connected with the various telegraph lines from Boston, as many longitude operations were being carried on for the Coast Survey. In this manner the attention of such portion of the public as were interested in such matters was drawn to the practicability of obtaining accurate time from the observatory, and in many cases regular arrangements were made for the transmission of the signals throughout Massachusetts and some of the other New England States. Indeed, at present, the time service of Cambridge furnishes the chief source of comparison in that section of the country; the observatory of Yale College also possesses such a service, which supplies Connecticut in like manner. The observatory of the Washington University at St. Louis, and that at Allegheny, Pa., also have extensive time service; and there are others covering less ground.

At Washington the Naval Observatory has dropped a time ball since the first occupation of the completed buildings in 1844, following the example set at Greenwich, eleven years earlier. At first the dropping was done by hand, upon signal received from the chronometer room; later this signal was sent electrically, and the dropping of the ball was performed automatically by the same signal. This ball served to give the moment of noon not only to the cities of Washington and Georgetown, but also to the Navy Yard and to such vessels as happened to be lying there. No telegraphic signals were transmitted, however, for several years, the Royal Observatory at Greenwich far outstripping us in that respect as a system of time signals to the important cities and towns of England was in operation as early as 1852. This, of course, was readily accomplished in a country of such small extent, where the difference of any given local time from that of Greenwich is not great; but in our own case, the great extent of longitude and the different local times through what was supposed to be the necessity of the case, conspired to prevent the extension of any such system. Local jealousies had also a part to play in the matter, as the railroads running out of Boston would not keep New York time, and *vice versa*.

With this brief retrospect of the course of events which has made the electrical distribution of time possible, let us return to the subject proper of this essay; and in so doing I beg leave to repeat a portion of the definition with which it began, viz: "By the electrical distribution of time is understood the causing of the instant shown by a timepiece at a central station to be marked by some apparatus prepared to receive the necessary signal at another station in electrical connection with such central station. It is essential, to secure the highest order of accuracy, that the central station shall always be at an astronomical observatory, and preferably one which is able to devote the services of one or more persons to this special duty." In order to a fuller understanding of the functions of an observatory, it will be necessary to call your attention to some of your early instructions in astronomy. The interval between two successive transits, or meridian passages, of the sun, is an apparent solar day; owing to the unequal motion of the earth in its orbit (or to put the statement in another form, to the apparent unequal motion of the sun in the ecliptic) two successive apparent days are not of the same length. As a constant standard of time is necessary, it has been found essential to assume an imaginary sun moving in the equinoctial (or the plane of the earth's equator) at a uniform rate, which is the mean rate at which the true sun moves in the ecliptic; the interval between two successive transits of this imaginary mean sun is a mean solar day, and in a clock keeping mean time, the hands would (if the clock were correct) point to 12h. 0m. 0s. at the instant of transit, which is known ordinarily as NOON. As a matter of fact, however, the sun is rarely used at observatories for the determination of time, but stars are employed instead; this is done, not only because the tables of the positions of the stars are more accurate, but because several stars can be observed at about the same time and the results deduced from these observations made to serve as checks upon each other. The interval between two successive transits of the same star is called a sidereal day; this interval is constant, and is (like the mean solar day)

*Proceedings Franklin Institute.

divided into twenty-four hours. Each star comes to the meridian at an earlier period than on the day preceding, if the transit be noted by a mean time clock; the difference between a star and a sidereal day is 3m. 56s. 56. and hence the sidereal 0h. is constantly getting ahead of the solar 0h., so that it is always necessary to reduce the *sidereal* time found by the star observations to that used in ordinary life, or to *mean* time. The positions of stars are given in the tables by their *declination* (similar to terrestrial latitude) and their *right ascension* (similar to terrestrial longitude); the right ascension of the star being reckoned from the celestial prime meridian, it follows that when any given star crosses the meridian, the sidereal clock should show the time given in the table as the right ascension of such star; the difference between the time actually shown by the clock and this right ascension is the error of the clock; comparing then the time shown by the sidereal clock with that shown by the mean time clock, we find the error of the latter. This is briefly the method followed by all observers, and hence is common to all systems of time signals. We have, then, as essentials of any such systems, (1) an instrument for observing the transits of stars; (2) a sidereal clock, and (3) a mean time clock. This mean time clock (like all timepieces) will not run accurately, its rate varying, being sometimes less and sometimes greater; the pendulums of such clocks are generally very well compensated for changes of temperature, but it has been found that the density of the air has a decided influence upon the rate at which the clock runs; when the barometer is high, the clock loses on its rate, gaining when it is low. In order, then, that the time which is sent out over the wires should be correct, it is necessary either to have some arrangement for correcting the standard mean time clock so as to make it correct, or else to have a similar clock which can be likewise corrected; such a clock is known as a transmitter.

The system of the Greenwich Observatory being the oldest in point of time merits the first description. The standard sidereal clock is a remarkably fine piece of workmanship, having in addition to a peculiarly constructed compensated pendulum, an auxiliary apparatus intended to still further aid in the compensation for changes in temperature, which it would be impossible to describe intelligibly without a drawing. There is also an arrangement for counteracting the influence of the variations in the density of the air, which is the invention of Sir George Airy, and is very ingenious; two bar magnets are secured to the bob of the pendulum diametrically opposite each other, one with the north pole down, the other with same pole up; below these at a distance of about four inches is a horseshoe magnet which hangs on one end of a walking-beam, to the other end of which is attached a float resting on the surface of the mercury in the cistern of a specially constructed barometer; with a rise in the barometer the horseshoe magnet rises nearer the bob and thus exerts a stronger influence upon the swinging magnets, causing the pendulum to oscillate more rapidly; the contrary takes place when the mercury falls. Notwithstanding all these refinements the published records of the observatory show that the clock does not run with perfect accuracy, a variation of its daily rate as large as 1.15 seconds being recorded in a year. It does, however, run with but slight variations of rate from day to day; still it shows as great a loss as one minute in six months; it is supposed to be regulated to lose a small amount daily, but the records show that it occasionally gains as much as half a minute in five or six months. I mention this here in order to show you that those people who talk about their clocks or watches running to within a few seconds a year are probably somewhat wide of the truth. This standard sidereal clock registers its beats upon the chronograph used in observing transits, controls the remaining sidereal clocks in different rooms of the building, and finally drives (in unison with itself) a sidereal chronometer. The controlled clocks are upon the Jones' system (as modified by Sir George Airy); in this system the secondary clocks are required to be quite as good time-keepers as the primary one, which makes it too expensive for general use among the public. As used at Greenwich, the standard clock closes a circuit in which the controlled clocks are placed, every second; on the pendulum of each of these latter is a magnet, which at the end of its swing enters a coil of insulated wire; as the current passes the effect is to hold the magnet within the coil, and hence to place the pendulum in a definite position, which corresponds in effect to that of the pendulum of the primary clock; this closes the circuit by means of a wheel on the seconds arbor, which presses upon a spring at each forward motion. The sidereal chronometer already spoken of in this connection, is constructed practically upon the same principle as those of Wheatstone, referred to in the early part of these remarks.

This sidereal chronometer is in the time service room and is used for the purpose of comparison with a similarly-constructed mean time chronometer which is driven by the mean time clock now to be described; this is essentially a galvanic clock of peculiar construction, and of which I imagine there are but few existing; as the pendulum swings to the right it closes a circuit through the coils of an electro-magnet which actuates a peculiar mechanism, by which, as the pendulum swings to the left, a weight is caused to impinge upon the pendulum thus giving it the impulse which in an ordinary going clock it receives from the weight or spring; this impulse is given at each alternate vibration. At each extremity of the swing of the pendulum it closes a circuit which, acting upon the coils of two electro-magnets, alternately attracts and repels the opposite ends of a balanced polarized armature; this rocking motion is readily converted into a rotary one, causing the seconds hand to revolve, and, by the usual device of a train of wheels, the minute and hour hands also; there are several clocks driven by this pendulum, including the mean time chronometer just mentioned as being in the time service room. The apparatus for correcting the error of the standard mean time clock consists of a magnet secured to the pendulum which swings over a hollow coil of insulated wire attached to the clock case; if a current be passed through the coil in one direction the magnet on the pendulum is attracted and the oscillations are more rapid; if a current be sent in the opposite direction the contrary is the case; a switch in the time service room serves to operate this arrangement when desired, and the battery is so arranged that it will accelerate or retard the pendulum at the rate of one-tenth of a second in a minute. The practical working of the observatory portion of the time service is as follows: The error of the standard sidereal clock is obtained by means of star observations as before described; at 9 A.M. daily, the mean time and sidereal chronometers in the time service room are compared by what is known as the eye and ear method; that is to say, the observer waits for the coincidence of the beats of the two instruments and notes the time shown by each at this instant; applying the error of the sidereal clock to the time shown by the sidereal chronometer, the correct sidereal time is found; by a comparatively simple operation the corresponding mean time is found, and from this the error of the mean time chronometer, or what is the same thing, the error of the standard mean time clock; suppose that this clock is found to be one second slow; the switch to the coil in the clock is turned in the accelerating direction for ten minutes, during which time the pendulum is swinging faster than usual, and at the end of this period the clock has gained the necessary second; and not only the standard, but all the clocks that are driven by it. In this condition the standard is in readiness to be used as a transmitter; it is in circuit which is closed automatically every hour by the operation of wheels within the clock itself. The closing of this circuit operates a relay which transmits a single beat (that of 0 minutes and 0 seconds of the exact hour), to the General Post Office in London, and also to the station of the railway leading to Deal. At this latter point a time ball is erected and is dropped by the hourly signal sent at 1 P.M. The hourly signal is also transmitted over certain private wires belonging to various jewelers, for the purpose of comparing their timepieces. In one case, at least, this signal is also used for the purposes of distribution, as will be noted further on. The line to Deal is for a short time virtually under the control of the observatory, so that a return signal is sent which announces the fall of the ball. A very ingenious adaptation of the galvanic clock described as the mean time standard is in use on this circuit. At a certain point where the line to Deal is looped in, this second clock is placed. It is regulated so as to have a gaining rate of several seconds, so that at 1 P.M. it is always too fast. When that hour is shown by the clock, the circuit which operates the electro magnet and thence the clock train is switched out automatically, and the Deal loop is switched in, the pendulum continues to swing until the passage of the signal from the observatory opens the circuit and the clock then moves on, showing the exact Greenwich time as it starts.

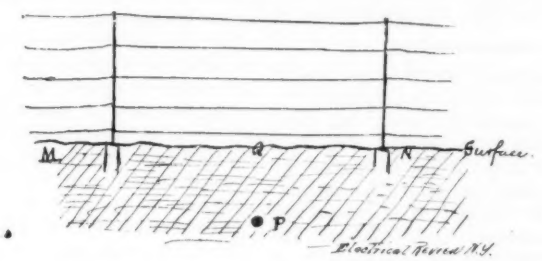


FIG. 2.—SECTION OF SOIL AND FENCE.

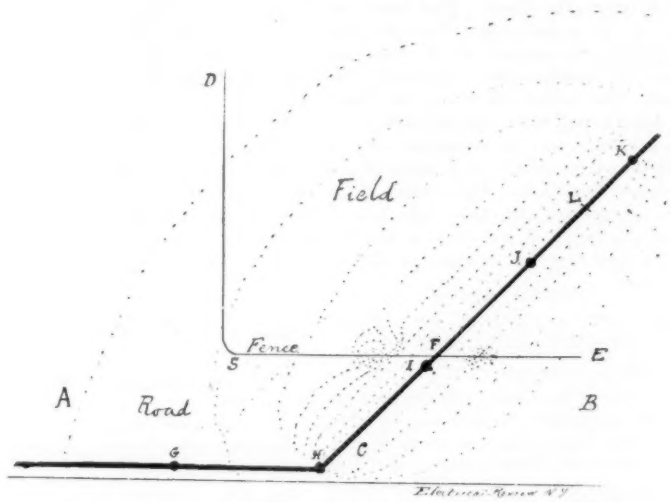


FIG. 1—(SEE "SOME PHENOMENA OF IMPERFECT GROUND").

On Some Phenomena of Imperfect Ground.

TO THE EDITOR OF ELECTRICAL REVIEW:

The following facts which have come recently to our notice, although not in any way novel, are instructive of the manner in which the ground behaves in a return circuit and will perhaps interest some of your readers.

One of the conductors of a three wire house lighting circuit became grounded lately by coming in contact with the iron tube containing it. The accompanying figure (1) shows the ground plan of the tubes, which, crossing the road, A B, diagonally at C, enter the field at the opposite side after passing under the wire fence, D S E, at F. The connecting boxes at every 20 feet are shown at G H I J K. The faulty tube was the length J K, and we can thus presume the position of the ground to have been at L some 25 feet from the fence in a direct line. The tubes are buried at an average depth of two feet in the soil of sandy clay and holes had been dug at H and K, where the box covers had been removed leaving the conductors however insulated, so that the metallic connection of the iron piping was broken at these points 60 feet apart, but the copper conductors were in uninterrupted communication.

The faulty main, disconnected beyond on the field side was connected at periodic intervals, to a dynamo at the road end some half mile away, the other dynamo pole being grounded direct; so that the potential of the main at the point L was at these intervals probably 100 volts, and some five amperes of current flowed steadily through to ground. As there was very little resistance between the conductor and the surrounding tube J K, the resistance of the ground formed by some 36 square feet of iron tube surface was thus about 20 ohms. The soil was superficially dry, but was wet at the depth of two feet where the tubes lay.

The section of the soil and tube at the fence is also shown in fig. 2. The fence consisted of the usual iron uprights and horizontal galvanized iron strands. It runs uninterruptedly for two or three hundred yards. The surface of the soil being represented by the line M N, the pipe passed below about the point P.

Under these circumstances it was found that standing on the soil above the pipe between M and N, with the hand on the fence, a distinct shock could be felt during the time the current passed from the dynamo into the faulty main, and along the roadside standing at S and E, as far as 27 feet on either side, the current could be detected with the tongue on the fence wire. On connecting to one of the fence wires a lead carried into the field, the current could be detected readily by the tongue, standing anywhere within a radius of about 40 feet from the line of tubes F K. On inserting a spade to a depth of two or three inches into the ground about the position Q (fig. 2.), and connecting the blade to the fence through the lead and a galvanometer, steady currents of 14 centiamperes were observed periodically with the flow of current—of which it represented about three per cent.—through the faulty main. Finally on connecting a wire directly to the ends of the piping H K, in the hole sunk at H or K, and leading this wire to the fence through a 16 candle power Edison lamp, the latter was periodically illumined to apparently full brilliancy, thus conveying say half an ampere or some ten per cent. of the total arriving current.

It was thus evident that the ground made by the outside surface of the tube, H K, was very inferior to that made by the iron fence, notwithstanding the dampness of the soil, and also that during the escape of current at L from the main, a series of equipotential closed curves, somewhat similar to the ripples of disturbance caused by the fall of a stone into a pond, formed round the tubes, probably at the surface, something like the dotted lines in figure 1. These lines would be closest together in the vicinity of the tubes gradually distending and separating outwards from it, and the direction of current would everywhere be perpendicular to the curves. In fact by bridging over these lines with the palms of the hands on the surface of the soil, it was easy to detect a shock in the vicinity of the tubes between F and K.

These phenomena here exaggerated in intensity owing to the bad conduction of the ground on this occasion, point clearly to what must probably take place in the case of all groundings however perfect they may relatively be. In all probability a series of radiating lines of flow are established much resembling at the surface between the ground-plates in circuit, the lines of force issuing from the poles of a magnet, and with equipotential lines everywhere normal to them. Such a series of equipotential lines might then be imagined to extend over many miles of country, and the marvellous sensitiveness of the telephone thus makes the many cases that are on record of earth conduction interference in telephony at great distances readily comprehensible, or in fact it would conversely be possible knowing the strength of current necessary to give audible sound in a telephone, and if we could measure the conductivity of the ground over large areas of country, to assign the position and distance at which plates buried in the soil would, when connected through a telephone, render audible the signals passing on a distant and outstretching telegraph circuit. I am Sir,

Yours faithfully,

A. E. KENNELLY,
Electrician Edison Laboratory,
Orange, N. J.

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Richmond, Va., now that the electric road is running so nicely, is opposed to steam railways in the city, and the council declined to grant a franchise.

Aluminum is coming into use as a material for dental plates. It is nearly as light as rubber, but little more than one-eighth the weight of gold, has neither odor nor taste, is not affected by the elements of food or the secretions of the mouth, and costs, bulk for bulk, about one-sixth the present price of silver.

Edison's scheme for electrical execution of criminals is the best so far presented. He proposes to manacle the wrists, with chain connections, place the black cap on the condemned, and at the proper time close the circuit. The shock passes through both arms, the heart and the base of the brain, and death is instantaneous and painless. The plan does away with the paraphernalia of chairs, necklaces, helmets, sandals and other complications hitherto proposed.

An accident happened lately on a Brooklyn electric railway. A woman was paralyzed in some way, and forthwith it was announced by the attending physician that the paralytic stroke was the consequence of an electric shock—no investigation, no examination of bystanders, but a purely gratuitous assertion. It is difficult to see how the woman could have received an electric shock. The system was an overhead one, and she herself says the trolley fell off before the shock. That being the case, it is a good deal like the fear of lightning on account of the terrifying crashes of thunder, after all danger has passed. The woman got a nervous shock and threw herself across the car (this is her own statement), and in this lies the cause of paralysis. It would be well if some of the physicians would follow the example of the wiser among them, and freshen up a little on electrical science. It would be a pleasant rest for them from the drudgery of pills and nostrums.

SOME PECULIARITIES OF ATMOSPHERIC ELECTRICITY.

Experiments recently conducted by Professor Weber show some marked peculiarities of atmospheric electricity. The professor placed two isolated conductors upon the summit of the Riesen Gebirge, that chain of mountains forming the part of boundary between Bohemia and Silesia, and southwest from Breslau.

Despite the fact that lightning displays are frequent in this locality, neither of the rods were struck.

Other experiments were made with kites having steel wires for strings. The discharge points on these kites included 400 steel needles.

The potential was measured by the length of spark discharge, and the current strength by a galvanometer. This last generally showed from .07 to 2.5 micro-amperes, and the first from 3,000 to 10,000 volts.

In times of heavy, dense clouds, no sparks were produced. With potentials of 11,000 to 20,000 volts, the current strength ranged from four to eight micro-amperes

COLLODION FOR TESTING AN ELECTRICAL CHARGE.

According to Professor Jouravski, of St. Petersburg, Russia, a dry pellicle of collodion is readily electrized negatively, and may thus be used as a test of an electrical charge.

To charge the thin collodion film, it is only necessary to draw it between the fingers. As it is extremely thin, and consequently elastic, it is readily attracted by bodies charged positively, and as readily repelled by a negatively charged body.

To prepare such a film, it is only necessary to pour the collodion on a level glass surface. When the ether has evaporated, there remains a thin film, which is readily removed by carefully peeling it from the glass. The film is then cut into narrow strips, each one of which is a complete electroscope, ready for use at a moment's notice.

ELECTRICAL ENGINEERS.

In the days that are gone there was a popular belief that a Jack-at-all-trades was a good for nothing, who botched everything and accomplished no good. It was conscientiously preached and believed that to be a competent workman at any calling, profession or trade, a certain amount of teaching, a given period of time and a stated term of service under instructions, were all necessary to the graduation of a master workman or a competent journeyman.

No lad, however smart and high born, could hope to wield the tools of his profession or art, with proper skill, or be received among the peers of that calling, until his seven years of apprenticeship has passed, and the tradesmen's commencement day had proclaimed him a free man. Times have changed. In this great land of liberty, the push and racket and scramble for place, position or pelf, has largely done away with the necessity which once existed.

There are hundreds of thousands who today, have never served a regular apprenticeship to the trades or callings they are following. The universal adaptability of the adopted citizen as well as the native American, enables him to pick up almost any trade or calling, and follow so much of it as he finds either agreeable or profitable. There are farmers who do all their own shoe mending and handle a soldering iron or a sadler's awl with as much ease as the harnessmaker himself; and there are tool chests innumerable, scattered throughout the length and breadth of the land, which enables so much as is necessary, of the carpenter's or cooper's or cabinet-maker's work to be done economically, if not quite so well, in the modest house of the proprietor of that half kit of tools.

In all these instances there is a commendable ingenuity, a laudable economy and a very proper outcome to this evasion of old time rules and restrictions. There is no possible chance of mishap which may result in loss of property or life from want of proper education, the part of the "*prentiss jour*," who does the work.

Want of knowledge or skill may cause the shoe to pinch, the pan to leak, or the plow-harness to give way, but no life or property can be endangered by the ignorance of the workman.

But there are trades and callings in which thorough education is a necessity, and the utmost care is requisite on the part of the workman, to ensure safety to persons and property and immunity from danger.

There are to-day in nearly every town in habitable America, of a few thousands inhabitants, men who call themselves electricians who are so called and considered by their employers who claim to know as well as the best taught expert, how to wire, install and run an electric light plant, yet whose every move in either of those three particulars has in it more chances of disaster than of success, of ignorance than of knowledge, and in which only the merest possibillity has often prevented most calamitous results.

We may ignore the losses of electrical and mechanical energy which invariably follow that class of engineering; the trials and tribulations of the company in trying to make both ends meet or lap-over on the gain side of the account—these are sad enough, but when the actual condition of such a plant becomes known, and the dangerous mine beneath our feet is discovered, we shudder at the sight presented.

This may seem an overdrawn picture, but it is based on facts, and the facts are as plenty as blades of grass throughout the length and breadth of the land. Here is one case, vouched for by an investigator. An electric plant in a large office building in which there is an amusement hall, was installed in the highest style of the art. Everything was in the best possible condition, when it was turned over to the owners, and a good man was placed in charge. By and by a new man took charge and anounced himself competent to do anything and everything necessary in the way of wiring, or other changes. He made such changes, and he made them with a vengeance. The wires placed by this expert were laid contrary to all rules for wiring as adopted by proper workmen—and the wire used might as well have been naked. Where this was carried through the floor there was no protection, and the brushes of the scrub-women short-circuited the current at several places. The safety strips fused and prevented mischief. The lyceum was saved.

One of the same class of self-made electricians, dissatisfied with the constant fusing of his strips, substituted copper wire, and but for the plant being a quite small one, and the building about as good as fire-proof, would probably have burned it. The accidental discovery of the wire removed both the difficulty and the cause of it at one swoop.

The country is full of that class of electrical engineers, and the employers, owners and renters of electric light plants sincerely believe in their fraudulent claims. What is necessary in the case is to know how to stop the growing danger, for the woods are full of it.

OUR CHICAGO LETTER.

(Special Correspondence.)

There has been little of general interest in electrical matters in the past week, outside the annual election of the club. This occurred, as previously announced, on Thursday evening. Vice-president C. A. Brown presided. This being a special meeting no business was transacted. The secretary and the treasurer read their annual reports, which were received and filed. The presiding officer then appointed Mr. Haskins and Mr. H. P. Pratt tellers, and ordered the ballot box placed for the reception of votes. This, by the constitution of the club, is a two hours' job, and the meeting was adjourned for that period.

The two hours didn't pass wearily, however, for the two tellers are chronic draughts-players, and between receiving ballots, trotting with the box to the windows to hear what Gen. Sherman calls "that —— old tune, again," having their eyes dazzled by the bright tin pails in the Gresham procession, and trying to get two for one on the checker board, the tellers were enabled to keep up quite well.

The nominating committee had prepared a regular ticket, and this, with but a few scattering votes, mostly put in to make the tellers earn their money, was elected, and is as follows: President, S. A. Barton; vice-presidents, 1st, C. A. Brown, 2d, J. P. Barrett, 3d, B. E. Sunny, 4th, H. Ward Leonard; secretary, W. A. Kreidler; treasurer, F. S. Terry; managers, C. D. Shain, F. E. Degenhardt, E. B. Chandler, J. H. Reid, Theo. P. Bailey, A. K. Stiles, C. C. Warren, W. J. Buckley, M. A. Knapp, Geo. L. Beetle; membership committee, C. C. Haskins, J. W. Clark, Geo. Cutter, W. H. McKinlock, F. W. Horne.

The city has been filled with strangers, low rates by all railway lines giving many the opportunity to mingle their business and pleasure, their sighs and their perspiration, regardless of age, sex, or previous condition of political servitude.

Customers of the various electrical establishments, who have not been in Chicago for years, in some instances have turned up and introduced themselves during the week, and good orders for wire, batteries, switches, carbons, etc., have resulted from the convention.

The illumination of the auditorium building has opened the eyes of the gentlemen from the backwoods districts, and given them a taste of electric lighting which will prove profitable in the future, not only in a dollar and cent way, but as a matter of wholesome education.

The two Ide engines, which have done the electrical convention work during the week, were placed by Mr. W. B. Pearson, and have done that gentleman much credit as an engineer and superintendent.

The hotel clerks tell some funny stories of their guests' tinkering and experimenting with the incandescent lamps. Here's the way one of these relates an incident:

"Man from Nebraska, up in 429, punched the button forty times, if he did once, in less than three minutes, when he came in from the street parade, see?—front! water for 172. Well, the boy went up flying, and found him wreathed in smiles and dust, 'n he wanted to know 'how 'n blank you take off the cover to these 'ere lamps to light a cigar?' Says 'ev'ry time I onscrew it the lamp goes out'—see? ''n he'd broke both the glasses projeckin' on the lamps,' the idiot.—Front! gentleman's card to 64. Funny, wasn't it?" C. C. H.

Chicago, June 23, 1888.

Anniversary of the Boston Electric Club.

A CELEBRATION BY ELECTRICAL PEOPLE THAT WAS ENJOYABLE AND INTERESTING.

'Twas a little more than one year ago that an announcement appeared in the Boston papers asking all interested in electrical pursuits to meet together for the formation of an electric club. As a result of this announcement several electrical men responded to the call, and on June 21, 1887, the organization of the Boston Electric Club was accomplished. Since that time the club has met with unlooked for success, the membership roll has increased to tenfold its original size, and with its interesting "talks" and pleasant "socials" it is destined to be one of the influential, scientific and practical organizations. The first anniversary of the organization of the club was fittingly celebrated on Thursday, June 21, 1888. The doors of the cosy apartments of the club were thrown open at one o'clock for the reception of the members and invited guests, and when a large number had assembled President P. H. Alexander made the following address of welcome:

FRIENDS AND MEMBERS OF THE BOSTON ELECTRIC CLUB:—It is with great pride and extreme pleasure that I bid you welcome in these rooms to-day, and congratulate you upon this first anniversary of the Boston Electric Club. Starting as we did but a short twelve months ago with nineteen members, and with the prevailing impression among the electric fraternity that a club of this kind could not succeed, we show on the roll of our membership book to-day over 250 members in good standing. Before this club existed, men engaged in the electrical business looked upon every one working in the same branch as a personal enemy, an interloper, and meeting their competitors only in a business way, in a way of sharp competition, they could not judge of his good fellowship or geniality. But as one by one the members of the electric fraternity became members of the club, there grew a warmer feeling, a feeling of fellowship between the gentlemen engaged in the electrical branches of business. Social intercourse has led also to an exchange of ideas in the technical and business branches of our science, and has doubtless proved of great benefit to every one who has joined our band. The management has undertaken, and, in my opinion, well succeeded, in fostering education in providing lectures by prominent men and having papers read by members and others upon special topics in which we are all interested, and this club has not only become a social but an educational institution, and, judging by the prominence of the members who have lately joined, the scientific advantages to be acquired in the future will even outrank those we have had in the past, while the social must of necessity grow better as we become better acquainted with each other.

Gentlemen, I hope in the second year of our existence every one will lend a helping hand to this institution, and that every man will consider it a duty he owes to himself, to this club, and to the electrical fraternity in general, to attend the meetings of this association, to help by his voice and vote to guide its course. He should visit the club rooms often, to show, by his good example, the fraternal feeling existing among the members of the club, and may the next anniversary find us assembled here, offering each other congratulations again.

The programme prepared was a very interesting one, and was carried out to the fullest extent, with the single exception of the expected address by Mr. T. A. Edison and Mr. E. T. Gilliland on the perfected phonograph. The absence of these gentlemen and their famous machine was a disappointment to many, but this was partly made up for by the exhibition of the graphophone by Mr. Melville Richards, the members and guests being entertained by the reproduction by the instrument of Mr. Moriarty's interesting song.

A letter of regret was received from Mr. Edison, in which he stated that the phonograph was not yet perfected, and that when it should be first exhibited publicly it would be at the Boston Electric Club. During the afternoon reception, a light lunch was spread in the parlors above, many of those present partaking occasionally.

The time was spent in talking and smoking until at 4.30, the coaches arrived for the invited guests, and the cars for the members, and the whole party was driven to the steamboat landing on Atlantic avenue, where the steamer "Nantasket" lay waiting for its distinguished passengers, to convey them through Boston's pretty harbor to the beach at Nantasket.

Arrived at the beach, the party marched up the hill to the Rockland House, where, after promenading on the verandas of the hotel for a half hour, watching the waves as they rolled upon the sand or dashed against the rocks, and enjoying the cool breezes from the ocean, the genial host invited the one hundred and thirty-two hungry souls to the dining hall. The table was arranged in five sections, the longest section forming the head, in the center of which sat the president. Natural flowers were prettily arranged upon the table, and before each plate was placed a very dainty card containing a very tempting electrical menu.

When all had done justice to the bountiful repast, and as the fumes of Havana and Richmond danced in ringlets through the air, the post prandial exercises began. The president arose, and after a few preliminary remarks, introduced the historian of the club, Mr. Allan V. Garratt, who spoke of the prosperity of the Club during the year. Mr. Frank Ridlon, the "Father of the Club," was next introduced, and spoke very glowingly of the future of the Club, urging that the social life might continue, and prophecying that if it went on as it had in the past, the Club would stand second to none of the organizations in Boston.

The secretary, Mr. Robert F. Ross, was now called upon to read letters of regret which had been received from Lieutenant-Governor Brackett, T. A. Edison, J. F. Morrison, of Baltimore, Otto A. Moses, Moses G. Farmer, of Eliot, Maine, General Francis A. Walker, president Mass. Inst. of Technology, Prof. Charles R. Cross, Edward Weston, Thomas Sherwin, President Eliot, of Harvard University, Leverett Saltonstall, Professor Elihu Thomson, Professor Trowbridge, Gen. John M. Corse, and George Worthington.

President Alexander introduced Mr. T. Commerford Martin, of the *Electrical World*, who spoke of the great aid which the electrical press had given toward the success of the Club.

Mr. Prescott, of the Boston *Globe*, stated that in the Electric Club there were all the elements necessary for complete success, and Professor Lewis Faunce, in replying for the Society of Arts, extended the courtesies of the society to the club. Several bogus telegrams were now read by Mr. Ross; one from J. G. Blaine, from the "top of Carnegie's coach," another from Judge Thurman, and a third from President Cleveland. Much laughter was evoked during the reading of the telegrams. Mr. De Camp, of the National Electric Light Association, spoke of the comparison of feelings between electric men of olden times to those of the present. Colonel Ransom, of *Modern Light and Heat*, was the last speaker, and wished the club every success and a great future. There were present during the day and at the dinner, Mayor O'Brien, Professor S. W. Holman, Professor A. E. Dolbear, Professor Lewis Faunce, Professor Francis Blake, Professor H. C. Buck, Chas. W. Price, Edward Prescott, A. V. Garratt, A. V. Abbott, M. A. Richards, E. R. Whitney, Weston Lewis, T. C. Martin, H. C. Spaulding, O. K. Stuart, E. W. Rice, Jr., Frank Ridlon, A. J. De Camp, Edward Blake, J. F. Baker, M. J. Wightman, F. W. Webster, H. B. Cram, G. L. Lang, G. W. Adams, C. D. Wainwright, E. M. Carhart, F. E. Clark, H. F. Campbell, H. W. Blake, W. H. Vialle, G. T. Whittier, J. T. Moriarty, Captain Brophy, C. L. Ireson, A. H. Chapman, H. D. Stanley, Cyrus O. Baker, Jr., Geo. T. Manson, G. W. Patterson, and others.

At nine o'clock President Alexander arose, declared the meeting adjourned, and the party started for the train which left at 9.30 for Boston via the Old Colony Line. During the ride to Boston singing was indulged in, and it was a jolly party that broke up at the depot with the universal opinion that the first anniversary of the Boston Electric Club had been an unqualified success.

Boston, June 22, 1888. L. A. F.

Columbus, Ohio, is running a central Edison station with 6,000 16 c. p. lamps connected, and about 60 horse-power in motors, and doing nicely. And the fact wants to be emphasized right here, that this is on an underground system.

Governor Hill's signing the electric death penalty bill is the commencement of a new era in the execution of criminals. If we must take human life as a punishment for crime, let it be done with some sense of decency. This step is more of an advance in the proper direction than was the making of executions private instead of displaying the unfortunate dangling from a hill-top gallows.

OUR PHILADELPHIA LETTER.

(Special Correspondence.)

It is an unusual thing to have to find fault with the REVIEW in the matter of typographical errors, but when you made my account of the new Westinghouse station in New York, *vide* your last issue, speak of their enterprise as contemplating the ultimate use of 7,500 lamps, you belittled the matter just ten times, for the capacity of the station is to be 75,000 lights, which you will recognize at once, as the biggest thing in the way of incandescent lighting yet contemplated.

The people of Vineland, N. J., are very much interested just at present on the subject of electric lighting, and by popular subscription, have gotten together sufficient funds to put in a plant to light the principal avenue of that thriving town; the choice of apparatus induced considerable competition, but has finally resulted in the selection of the Schuyler and the contract for the installation has been given to Stephen Holbrooke, who owns the Schuyler plant in the adjoining city of Millville; a careful inspection of this plant by the promoters of the Vineland enterprise, convinced them that they could not go wrong in following Millville's example.

Philadelphia has been favored this week by visits from three eminent New Yorkers, in the persons of George T. Manson of the Okonite Company, P. C. Ackerman of the American Electrical Works of Providence, and Henry B. Lytle of the Auxiliary Fire Alarm Company; they apparently recognized the fact that the town was not large enough for their united presence, and therefore came on different days. Of course everyone was glad to see them, and to learn that in their respective lines, trade was never better.

George Porter, who emulates Sara Bernhardt, by standing with one foot in Pittsburgh and the other in Philadelphia, was on his Philadelphia foot this week, also, and has twice ascended to the seventh story of the Bullitt Building for a chat with your representative, and to enjoy the only cool breeze to be found this week in the city of Brotherly Love.

I was intending to write you an account of our last great storm, but a perusal of your Chicago letters convinces me that Brother Haskins has a corner in the storm monopoly for the present, and I gracefully succumb, promising to fill the gap as soon as he lets up.

Cloud, of the Thomson-Houston Company, has again been "knocking things" by his capture of the 30 light arc plant to be installed in the clothing house of Blumenthall Bros., 42 North Third street. He has also recently sold a second 12 light plant to John Greer for his factory building at Sixteenth and Reed streets. Jimmy Richmond, another agent of the T-H., has likewise been successful in selling a plant to Simons & Co., of Market street; this is one of the composite plants of 38 arcs and 35 series incandescents on the same circuit.

Messrs. Morris and Salome, of the Julien Storage Battery Company have just patented a process for filling the grids of their cells, which is destined to have a marked influence in the cost and perfection attending this delicate operation; it is calculated that five men by this process can do the work formerly occupying the attention of thirty-five, and at the same time giving very much better results in the matter of the regularity of the filling; the result will be a very great reduction in the cost of manufacture, probably one-half of that which now obtains.

Philadelphia, June 25. S. H.

Feed Water Heaters.

The National Pipe Bending Company, of New Haven, manufacturers of the national feed water heater, report the delivery during the month of June of heaters aggregating 4,000 horse-power, and among the electric light stations supplied are: 300 horse power to Narragansett pier electric light station, R. I.; 300 horse-power to North Shore station, Revere, Mass.; 500 horse-power to Georgia electric light station, Atlanta, Ga.; 100 horse-power to Atlantic City, N. J.; and 100 horse-power to Augusta, Ga.

A Trip to Boston and a Visit with Her Electric Club.

It has been the privilege and pleasure of the writer to attend many gatherings of electrical men, and a particulary enjoyable meeting of these "couriers of the coming millennium"—as Mayor Hewitt would say—was the one celebrating the first anniversary of the Boston Electric Club.

The New York and Philadelphia representatives sailed gayly forth from a New York pier Wednesday evening, comprising in quality and good spirits what was lacking in numbers. The roll call on board the electrically lighted steamer "Rhode Island" brought answers from DeCamp of Philadelphia, Keller of New York and Boston and Texas, Stanley of Brassport, Baker of N. G. (New Gersey), Peck of Brooklyn, and Manson and McQuestion of New York. The narrator was present also, at times to his poignant sorrow.

There was not much sea sickness on the part of the travelers, and with the exception of some slight annoyance from the boat's whistle, which Stanley soon plugged, and the needed cleaning out of a combine of sharpers at "hearts," composed of the electrical countrymen, the party arrived in Boston in excellent condition to enjoy that city's hospitalities.

Fred. Gilbert s two bull-dogs were unable to keep out the wicked visitors. A happy thought came, and a note with a well-known Bostonian's name signed to it was suddenly brought in asking the gentlemen to meet the supposed writer at a lemonade stand ten blocks away. The office was immediately vacated; one of the party, a nutmegger, losing his hat in the rush; and the astute Gilbert quietly tearing up the note and complimenting his accomplice on his excellent handwriting, placed a stalwart guard at his door to keep out such characters thereafter.

It was the opinion of the visitors that they did not miss a turn, but they would like to know who wrote that lemonade invitation, as the meeting place it announced proved to be a Chinese laundry.

It was "baked-bean" day at Young's hotel, but no one in the party would eat them—after the fourth order. Knowing how well pleased an editorial staff is to receive a host of callers on the day of going to press, the wicked ones of the party filed into the offices of *Modern Light and Heat*, and proceeded to edit. Manager Ross was equal to the occasion, and four badly scared alleged electricians were soon attracting the attention of the street and the admiration of lovers of agility by the rapid manner in which they descended the fire escape. The next time wicked electrical jokers visit an editorial room, with meretricious intent, they should be careful not to announce it so long ahead.

Explaining to the policeman that it was customary in their country to leave buildings in that way, and claiming acquaintanceship with the Hon. Fred. A. Gilbert of Boston, which familiarity was properly rebuked later, the visitors dropped from the fire escape and hastened to the hospitable office of Mr. Frank Ridlon where they received a warm welcome from the office boy, who had evidently been forewarned. The window was the means of escape this time, and the Electric Club kindly cared for the affrighted wanderers thereafter.

The reception, the water ride to Nantasket, the elaborate dinner at the Rockland House, the brief, pithy speeches, and letters and telegrams of regret, listened to by 130 members and guests, were all enjoyable events, and the ride back to Boston at 10 o'clock at night was made cheerful by excellent singing and general good humor.

Hospitable, indeed, is the Boston Electric Club, and its first anniversary is, no doubt, but a forerunner of many similarly delightful occasions.

It is certainly not amiss to speak of the praise which was so generously bestowed upon Secretary Ross and Treasurer Boynton for their efforts to make the anniversary the success it proved to be. President Alexander, Dr. A. V. Garratt, Mr. H. B. Cram, and other members received much merited praise.

The club possesses every appearance of strength and vitality, and is, no doubt, destined to enjoy a great and influential future.

TELEGRAPHIC

.... The Western Electric Company of Chicago has put a complete fire alarm system in the Stewart Hotel, San Bernardino, Cal.

.... Evidently the Richmond fire alarm system recently adopted in Los Angeles, Cal., is not giving perfect satisfaction. The Grand Jury recommend that "*if*" the electric fire alarm system "*is still unreliable*," it be condemned, and a new one put in.

.... Mr. F. A. Gentry, who has charge of the department of supplying poles for the Western Union Telegraph Company, brought with him to Atlanta, last week, 500 red cedar poles to be erected along the line of the Chattanooga, Rome & Columbus railroad. Mr. Gentry informed a *Times* reporter that the poles would now arrive rapidly, another 500 being due next week, and that the entire supply would shortly be on the ground. The work of placing them will be begun next week, and the line will be completed in the shortest possible time. It will not require more than two or three weeks to finish the entire line, after all the material is ready. The wire for the entire line of the Chattanooga, Rome & Columbus has been purchased and shipped, and is expected to arrive at once. So that it will be seen there will be no delay in getting the entire system completely wired in a very short time.

Telegraph Legislation in Congress.

At the opening of the present session of Congress the still recent consolidation of the Baltimore & Ohio telegraph system with the Western Union Company, had attracted an unusual share of public attention to the subject of governmental regulation of telegraphic traffic and tolls. The fact that the Western Union had again succeeded in getting its most serious competitor permanently out of the way, and that the low rates to which the competition between the two companies some time previously had accustomed the public, were immediately raised to a higher basis, naturally tended to increase the disposition to regard with favor regulative legislation, or even the entry by the general government itself as a competitor in the telegraphic field.

No small number of proposed measures were accordingly brought forward as soon as Congress met, dealing with the problem in one or the other of the manners referred to. It was, however, very generally felt that the multiplicity of subjects of pressing interest, political or otherwise, which would occupy the attention of the national legislature, left little room for any sweeping enactments in regard to a matter of such magnitude and importance as the telegraph interests of the country. Consequently there has been little progress made with any of the more general enactments on the subject, and it might be said that, to a certain extent, the public interest on the subject, as well as the demand for governmental interference, has declined, in which connection it may be noted that the advanced rates put in force by the Western Union Company have been apparently adjusted with a view to exciting as little public disfavor as possible. The effect of the absence of competition and advance in charges on the company itself is, however, clearly shown by its increased ability to pay dividends.

Two measures only of any moment regarding the telegraphs seem likely to be disposed of in Congress. One of these is an act directing the land grant railroads to maintain and operate themselves the telegraph lines along their roads, which in nearly every instance they have surrendered or leased to the Western Union Company. This law, which seems to be designed to force the land grant roads into compliance with one of the terms of their charters and grants, has passed the House of Representatives and has substantially received the approbation of the committee of the Senate, and will probably pass that body.

The second measure is the so-called "Spooner bill," which gives the Interstate Commerce Commission jurisdiction over the telegraphs of the country, with powers assimilated to those it now possesses in relation to the railroads of entertaining complaints regarding unreasonable charges and discrimination, and in a measure applies the short-haul principle to telegraphic business. For this bill's passage there seems to be a fair prospect, the general belief being that, while it may not afford an adequate remedy for some of the evils in the situation, it at least is an entering wedge in the direction of regulation, and provides a tribunal to which complaints may be presented.—*Bradstreets.*

An Electrified River.

THE BOYS OF ANSONIA FIND A NEW PLEASURE IN SWIMMING IN THE NAUGATUCK.

A dispatch from Ansonia, Conn., to the *Sun* of New York, dated June 21st, contain the following interesting fairy tale: "Ever since the electric street railroad has been in operation great difficulty has been experienced with the escaping current. By the system adopted here the current is conveyed to the motors from the central plant by a system of overhead wires. From the motor the current passes through the wheels to the rails, and is supposed to return to the plant again. But it does not—all of it. There is a big quantity escaping all the time, varying in intensity according to whether the cars are running light and on a leval stretch of track, or whether they are heavily loaded or going up some of the steep grades, of which there are several on the line. The electricity escaping into the ground effects the telephone system and causes a disagreeable and annoying buzzing sound. Besides, it causes the drops to fall in the central office, and no way to remedy the difficulty has been found.

"Last week, Mr. C. D. Warner, a local electrician, determined to test the power of the escaping current. A wire was grounded near the electric plant in Derby, no connection being made with the track, and was then run into his office in Ansonia, some three miles away. Here it was connected with the gas pipe at his desk. The wire was cut, and a Maxim incandescent lamp was attached to the ends. The lamp was of fifty-five volts, or 16-candle power. The carbon at once began to glow, and as a car passed along Main street in front of his office, the lamp gave forth a clear light as strong as if on a regular light wire. As the car rolled further and further away the light grew dim, but when the grade at the foot of the Derby Hill was reached, and the motor took more of the current from the wire, the lamp again shone forth as brightly as ever. An Edison lamp was also attached, and though this required 120 volts to cause a regulation light, it showed up clearly, and gave forth light enough to read by.

"It remained for the ever-present small boy to discover a benefit in the escaping electricity. Not far from the street where the tracks are laid runs the Naugatuck River. In this the boys are wont to bathe. On Saturday, when the youngsters meet in swimming, they were astonished at the pepuliar sensation they experienced. It was not at all disagreeable. On the contrary it was pleasurable, though at times some of the boys would give a jumb and a yell as though they had stepped on a piece of glass and cut their feet. The feeling was so pleasant that some of them remained in the water for hours, and only came out when hunger forced them to go home for supper. It is learned by experiment that the sensations were caused by the electricity, and it is proposed by the shrewd Yankees of this money-making town to lease the banks of the river and establish bathing houses, that people may take a pleasant, invigorating electric bath at a small cost."

.... At the annual meeting of the Franklin Telegraph Company the following named were elected directors: J. V. Horne, C. A. Tucker, Thomas Roche, Norvin Green, T. J. Eckert, F. L. Ames, Jay Gould, A. R. Brewer, J. T. Greenough; treasurer, R. H. Rochester; clerk, Thomas Roche.

Looking at the Phonograph Doll.

A party of Essex County teachers visited the laboratory of Mr. Edison recently. Mr. A. E. Kennelly did the honors.

Of all the departments visited by the teachers, none afforded so much delight and wonder as did that in which Mr. Edison is perfecting his wonderful talking doll. As the teachers filed into the room Prof. Kennelly picked up a doll from the table.

"This," he said, "is Mr. Edison's talking doll."

The doll was an ordinary thing and it wore a red Mother Hubbard dress.

"I will now remove its dress," said the professor, "and show you how it is worked."

The teachers became noticeably nervous, but they bravely stood their ground. The professor then quickly unbuttoned the waist of the little creature, displaying a tin chest, which, with the head and shoulders, he lifted from the rest of the body.

"This baby has no lungs," he said, "and, unlike other babies, will only talk and cry when you make it."

He then showed how the doll works. The phonographic machinery is all placed in its body, and from its chest the small crank protrudes. By turning the crank the phonograph is operated, and the doll speaks. One of the speaking machines was on the table, and Prof. Kennelly showed how it worked. It is a little larger than the machine intended for the talking dolls, and is not yet quite perfected, the articulation being indistinct at times. The professor applied his hand to a crank at the side of the machine. A funnel-like cornucopia was attached to the machine, and as the crank was turned, out came the words:

Twinkle, twinkle, little star,
How I wonder what you are.

Good night, mamma, good night.
Mamma, I love you.
G-o-o-d n-i-g-h-t.

The words could be heard in every part of the room, and the audience was filled with wonder. The words were repeated again and again. As a sentence is spoken into the phonograph, a needle makes indentations upon a wax cylinder to correspond with the waves of sound. As these indentations do not wear out, the same words can be repeated as often as is desired. Certain sentences will be placed in the phonographs in the dolls, but those who purchase the toys can procure wax cylinders containing other words, and so have the doll armed with a variety of sayings.

Among other wonderful things inspected by the visitors was a calculating machine in the office of Mr. Kennelly. The machine can multiply, subtract and divide up to twenty figures. The professor said that hundreds of hours of labor were daily saved by the machine. He also showed the astronomical clock, which is connected by electrical apparatus with Washington. The exact moment the sun crosses the meridian every day is recorded in Prof. Kennelly's office, and the clock is regulated accordingly.

Effect of Chlorine on the Electro-Motive Force of a Voltaic Couple.

BY DR. G. GORE, F. R. S.

If the electro-motive force of a small voltaic couple of unamalgamated magnesium and platinum in distilled water is balanced through the coil of a moderately sensitive galvanometer of about 100 ohms resistance, by means of that of a small Daniell's cell plus that of a sufficient number of couples of iron and German silver of a suitable thermo-electric pile (see Proc. Birmingham Philosophical Society, vol. iv., p. 130), the degree of potential being noted, and sufficiently minute quantities of very dilute chlorine water are then added in succession to the distilled water, the degree of electro-motive force of the couple is not affected until a certain definite proportion of chlorine has been added; the potential then suddenly commences to increase, and continues to do so with each further addition within a certain limit. Instead of making the experiment by adding chlorine water, it may be made by gradually diluting a very weak aqueous solution of chlorine.

The minimum proportion of chlorine necessary to cause this sudden change of electro-motive force is extremely small; in my experiments it has been one part in 17,000 million parts of water; or less than $\frac{1}{7000}$th part of that required to yield a barely perceptible opacity in ten times the bulk of a solution of sal-ammoniac by means of nitrate of silver. The quantity of liquid required for acting upon the couple is small, and it would be easy to detect the effect of the above proportion, or of less than one 10,000 millionth part of a grain of chlorine in one-tenth of a cubic centimeter of distilled water by this process. The same kind of action occurs with other electrolytes, but requires larger proportions of dissolved substance.

As the degree of sensitiveness of the method appears extreme, I add the following remarks: The original solution of washed chlorine in distilled water was prepared in a dark place by the usual method from hydrochloric acid and manganic oxide, and was kept in an opaque well-stoppered bottle in the dark. The strength of this liquid was found by means of volumetric analysis with a standard solution of argentic nitrate, in the usual manner, the accuracy of the silver solution being proved by means of a known weight of pure chloride of sodium. The chlorine liquid contained 2.3 milligrammes, or .03565 grain of chlorine per cubic centimeter, and was just about three-fourths saturated.

One-tenth of a cubic centimeter of this solution ("No. 1"), or .003565 grain of chlorine was added to 9.9 cc. of distilled water and mixed; one cubic centimenter of this second liquid ("No. 2"), or .0003565 grain of chlorine, was added to 99 cc. of water and mixed, the resulting liquid ("No. 3") contained .000003565 grain of chlorine per cubic centimeter. To make the solutions ("No. 4") for exciting the voltaic couple, successive portions of $\frac{1}{10}$ cc. or $\frac{1}{20}$ cc. of "No. 3" liquid were added to 900 cubic centimeters of distilled water and mixed.

I have employed the foregoing method for examining the states and degrees of combination of dissolved substances in electrolytes, and am also investigating its various relations.

The Water Jet Telephone Transmitter.

This transmitter has been recently exhibited in England, where it has attracted attention, both by its novelty and its excellent performance as a long distance transmitter. The following is an abstract from a lecture recently delivered by Mr. G. W. De Tunzelmann: "The jet transmitter consists of a small jet of water, acidulated to render it a conductor, falling upon two electrodes, consisting respectively of a platinum wire and a platinum ring concentric with the wire and separated from it by a ring of glass or ebonite. The connection between the electrodes is formed by the nappe of the jet; and, when the jet is thrown into vibration by the sound of the voice, the variation of resistance between the electrodes causes it to act as a transmitter of great delicacy. This delicacy is so great that the voice of a person speaking in an ordinary tone at a distance of fifteen or twenty feet from the instrument is reproduced in a distant telephone with the most perfect distinctness."

Personal.

Prof. Elihu Thomson, the eminent electrician and inventor, is receiving congratulations over the arrival of a son, Sunday, June 17.

Elmer A. Morris, electrician upon the motor road at Ansonia, started Monday evening for Dayton, O., where he will take charge of an electric road, and endeavor to place it in good running order.

Mr. S. A. Duncan, of Pittsburgh, is visiting in the West, recuperating his health. He will return in good time for the New York meeting of the National Electric Light Association next August.

Mr. Henry D. Hall, so long and favorably known in connection with Train Telegraphy, has been obliged to resign to look after some large mining property in which he is interested in Colorado. His headquarters will be in in New York, upon his return from the mines. The Consolidated Railway Telegraph Company passed resolutions of regret upon the receipt of Mr. Hall's resignation.

Southern Electrical Notes.

ANNISTON, Ala., June 19.—Sheffield, Ala., has made arrangements for a telephone exchange, the requisite number of subscribers having been secured.

It is alleged that the general manager of Sheffield (Ala.) Land Company will not permit the electric light wires to be run from that place to Tuscumbia, because it is feared that it will be detrimental to Sheffield for Tuscumbia to have electric lights.

Mr. A. W. Fuller, superintendent of the Birmingham (Ala.) Electric Light Company, was recently married to Miss Rena Gill, of Lynn, Mass.

Col. Samuel Livingstone, of the North American Lighthing Rod Company, of Philadelphia, is in Atlanta, Ga., in the interests of his company.

Three instances of the fatal effects of lightning have been reported here the past week. At Georges, S. C., lightning struck the house of Professor McConner, and instantly killed Miss Annie Brown, aged twenty-two. The lightning entered a window, passed over an infant in a cradle without injuring it, and struck Miss Brown, who was sitting in a chair in the middle of the room. The second instance reported is from Orangeburg county, S. C., where, during a thunder storm, lightning struck a tree under which there were thirteen hogs lying, ten of which were killed. Their bodies showed no outward effects of the stroke. The third instance, though not accompanied by any loss of life, occurred about nine miles from Huntsville, Ala., where a building belonging to the Huntsville Nurseries was struck by lightning and set on fire. The building was completely destroyed; loss, $2,000.

The city council of Birmingham has ordered six more electric lights for the business streets, and additional lights are being placed at the different points throughout the residence portion of the city.

The business of the electric light department of the Anniston, Ala., Land Company is increasing rapidly. The 10 new arc lights ordered by the city have been placed into position, and are giving satisfaction under the administration of Mr. Snyder, the company's diligent electrician. The demand by private consumers is increasing so rapidly that the company is seriously contemplating the purchase of an additional dynamo of 30 or 35 light-power.

The business of the defunct Pan Telephone Company, of this city, has been finally closed up, and the 'phones, batteries, and other apparatus have been packed for shipment. The greater portion of the wires are still in position, while some are hanging in the streets obstructing pedestrians. These are all to be taken down shortly.

The Bell Telephone exchange of this city, through the untiring efforts of the clever manager, Mr. Dozier, has within the past year enjoyed a steadily increasing business, beginning with a small number of subscribers, until the number secured is now near one hundred.

By to-morrow or next day the new Gamewell electric alarm system will be in operation in Birmingham, Ala. The wires, boxes and batteries are all up, and the connections were made to-day.

The contract for electric light at the Chautauqua Assembly to be held shortly at Salt Springs, Ga., has been awarded to Mr. Howell Palmer, of the Thomson-Houston Company. They will put up a combined plant of arc and incandescent lights. Twenty-five of the former and 300 of the latter. Work has already begun. The contract for the steam plant for the electric lights was awarded to Lederle & Cook, of Atlanta.

At a recent meeting of the Board of Aldermen of the city of Richmond, Va., the Richmond City Railway Company petitioned to be authorized to use electricity as a motive power in place of their present motive power, horses.

Mr. J. Thompson Brown, president of the Richmond, Va, Union Passenger Electric Railway, has resigned, and Mr. William R. Trigg, president of the Richmond Locomotive and Machine Works, is prominently mentioned as his successor. The new board of directors of this company is as follows: James N. Smith, Henry Steers, Thornton N. Motley, James M. Motley, Maurice B. Flynn, John F. Barry, New York; J. Thompson Brown, Valentine Hechler, Jr., Frederick C. Brauer, Charles L. Todd, William H. Scott, William R. Trigg, Richmond.

The people of Gadsden, Ala., are highly pleased with the success of their incandescent system of lights. The first lights were turned on during the past week, by Mrs. W. P. Lay, wife of the general manager.

EDWARD A. OLDHAM.

Tanner's Telephone Attachment.

The transmitter attachment, illustrated on this page, is the invention of Mr. N. A. Tanner of New Haven, and has met with favor among telephone users. It is provided with an air chamber separate from the speaking tube, the chamber having a back perforated in a particular manner to relieve concussion and avoid the rattling of the transmitter diaphragm, which sometimes destroys the value of the original sound vibrations produced by the voice. The attachment is made out of solid brass, nickel-plated and highly polished. No screws are necessary to fasten it in place, as it clamps automatically and firmly to the transmitter box. The E. S. Greeley & Co., of New York, are handling the invention.

TELEPHONE TRANSMITTER ATTACHMENT.

*** Wonder if it is the hot weather that is provoking the general onslaught being made on the innocent and inoffensive telephone?

*** A long distance telephone office has been filled up in very handsome style on the first floor of the telephone building, No. 18 Cortland street. It is well patronized and conversations are constant between New York and the surrounding cities of Philadelphia, Boston, Albany and intermediate points.

*** Mr. E. L. Smith, formerly general superintendent of the Missouri & Kansas Telephone Company, has located in National City, Cal., and is winning fame and shekels in the real estate business. Mr. Smith is a successful business man, and his many telephone and telegraph friends will be glad to hear that he is so satisfactorily located.

*** The Southern New England Telephone Company has decided to erect a large building at New Haven, Conn., which will be used for the general offices of the company and the exchange of that city. The business of the company has increased so fast during the last few years that such a move has become a necessity; but the matter has been delayed owing to the lack of a suitably central location. The site of the old Cook carriage shop on Court street has been secured, and the selection is a satisfactory one. Just when the building will be constructed and what its style and dimensions will be are not known, as the plans have not been sufficiently matured, but the building will be erected as soon as the details can be perfected. The new structure will probably be about 75 by 100 feet.

Don't Believe in Lightning Rods.

"Lightning rods are going out of use. Why? Because they are not believed to be the protection that it was once thought they were." This was what an electrician told a reporter of the Philadelphia *Record*. Fifteen years ago the lightning rod agent was everywhere in the land, and more especially at every farmer's door. To-day, it is claimed, their number has materially decreased, and farmers are discontinuing the use of the rods.

"What is your opinion upon the subject of lightning rods?" was asked of Chief Walker, of the City Electrical Department.

"Candidly, in nine cases out of ten," he replied, "I think they are humbugs. I believe it is a fact that more barns are struck and burned that have lightning rods on than with them off. In the first place, it is best to keep electricity as far away from a building as possible. The object of the lightning rod is to attract it. The rod if supposed to act as a conductor of the electrical current to the earth, but, instead of being carried off, the current, in consequence of faulty construction of the rod or attachments, is frequently switched into the building. The end of the wire is supposed to be buried in moist earth, the moisture acting as a good conductor. Without strict attention the iron becomes oxidized and rusts off, and then the rod is worse than nothing. It is a positive danger under such circumstances, attracting the electricity of the atmosphere and having no adequate outlet for it. Then, again, the same danger arises when the insulators upon the sides of the building become defective. The lightning is attracted from the atmosphere, where it might have remained but for the rod, and it is turned loose against the building on its way to the earth. If, for instance, the attachments on a barn are poor or worn out the current may be deflected and set fire to the building. This is no uncommon occurrence. In this city some years ago the rod on the Belmont Water Works was struck, and it fused. The current flowed on down and played about the machinery in the liveliest kind of a way. A big stone was knocked off the Washington monument by lightning. When the ground contact is good and the lightning is about to strike a building a rod may be of use, but I think the rods do more harm than good. There was a time when farmers were scared into rodding their barns and houses, but I think they are getting over that."

*** Councilman Hoar of Boston, presented an order that a joint special committee, consisting of five members of the council, with such as the board of aldermen may join, be appointed a committee to investigate the matter of telephone charges in the city of Boston, and report in print their finding and recommendations at the first meeting of the council in September, the committee to sit during the summer months and be empowered to summon witnesses and employ a stenographer. The order was read twice and passed. President Barry subsequently appointed the following committee on the part of the common council: Messrs. Hoar, Brooks, McLaughlin, Chamberlain and Dolan.

Telephonic News

*** The Los Angles, Cal., grand jury recommend placing the telephone and telegraph wires underground.

*** The Executive Committee has decided that the next meeting of the National Telephone Exchange Association, which will be held in the city of New York, shall commence on Tuesday, Sepember 4, 1888.

*** The telephone company at Birmingham, have about concluded their experiments, and think they have succeeded in locating the trouble from the electric road. But how it can be remedied is not announced.

*** To determine the existence of a poor connection and to locate it, Mr. A. Barrett, in charge of the Kansas City switchboards, measures the circuit for resistance with a single cell, and then with six or eight cells. If a poor connection exists the two measurements will vary considerably; if not there is no perceptible difference. He finds this reliable and useful.

*** The uselessness of the telephone in Anniston would be very greatly enhanced if the urbane and efficient manager, Mr. Dozier, would employ some competent and careful person to attend to calls. The boys who are employed for that work now are careless and indifferent, and should be put out, especially at night.—*Anniston, Ga., Hot Blast.*

Better employ girls, and then the *Hot Blaster* will be happy if he is a gallant southerner.

*** The amount of damage done in the aggregate at St. Louis by the electric storm recently, was very large. Three houses were struck, fortunately without fatal results, except to a superannuated horse, which was killed in the stable. The telephone service was most seriously interrupted, more than five hundred lines being rendered temporarily useless, while a number of instruments were broken by the electric currents. Many of the bells kept up an incessant ringing, greatly to the perplexity of their owners, whose loudest helloes failed to elicit any response. The company's entire force was at work replacing and repairing wires damaged by the storm, and by night the service was almost completely re-established.

*** Says the *Globe Democrat*: "An interesting question has grown out of the truce patched up between the company and the city, and that is whether or not the telephones taken out of the City Hall will be restored. During the time the company was carrying out the removal resolutions the boxes were taken out of the Mayor's office, House of Delegates, Register's office and Water Rates office. All the contracts had expired and the telephones came under the same head as the others. The agreement of the company, by which the boxes that were removed are being replaced, provides that every subscriber shall in addition to signing the $50 contract, sign a supplementary agreement binding him to pay an additional $50 if the company wins in the end. Comptroller Campbell stated yesterday that the city would not agree to the provisions of the supplementary contract, as it presumed that the ordinance was valid, and that such a presumption would remain until the contrary was established. He said that if the city demanded telephones the company would have to put them in at the rate of $50, without any supplementary contract. 'I do not know,' he said, 'whether or not the telephones will be ordered before the case is settled or not, but I know the city will not agree to a second contract.' City Counselor Bell said that the city could get along without the telephones that had been removed from the hall until the case was decided."

The Sprague Company have closed the contract for equiping the Hartford and Weathersfield Railway.

The Pacific Power Company of San Francisco, Cal., has put up two 4-horse-power motors to run the press of the Mining and Scientific Press, and the elevator in the building.

A new and mysterious motive power, of which no definite description is given, has been recorded in Washington. One William Jennings, of Southport, Lancashire, England, is the inventor, and Jean Badere, of San Francisco, is associated with him. Electric motor inventors need not feel discouraged yet.

The Huntington Electric Lighting Company, W. Va., has consolidated with the Electric Street Railway Company of that city, and will hereafter be known as the Huntington Electric Light and Street Railway Company, with enlarged privileges.

Mr. T. McCoubray, New York manager for the Baxter Motor Company, has effected arrangements with the Julien Electric Traction Company by which the latter contracts to use the Baxter motor at its stations. A six horse-power incandescent motor has been ordered, the first of several that the Traction Company will need for various uses in its stations in the city along the line of the Fourth avenue surface road.

The work of constructing the new electric railway along Revere Beach to the Ocean Pier Section is making rapid progress in the latter direction, and it is expected that when completed the road will form a complete line from the Pier to the Point of Pines. Some delay has been experienced owing to the necessity of crossing at Ocean avenue, near the Pier, a portion of land in regard to which there is a disputed claim of long standing. The electric power for the operation of the new road will be supplied from the electric light station which is now in course of construction on the northerly side of Beachmont Hotel.

Messrs. Dowd & La Rue, city agents of the Sprague Motor Company, report sales of the standard motors the past week as follows: Brown & Rittinhouse, 139 Reade street, 10 horse-power elevator; Jno. A. Willett & Co., 137 Reade street, 10 horse-power elevator; Rufus L. Cole, 141 Reade street, 5 horse-power elevator; P. Dauphin, 151 Fulton street, ½ horse-power machinery; Lehr & Lock, 37 John street, 1 horse-power machinery; Heller & Birdel, 22 Maiden Lane, 1 horse-power machinery; John Robinson & Co., 45 Murray street, 2 horse-power elevator; C. G. Braxmar, 36 Cortlandt street, 1 horse-power machinery; Lazell, Dalley & Co., 110 Beekman street, 7½ horse-power elevator and machinery; Kalle & Co., 77 John street, 5 horse-power machinery; Jas. S. Barrow & Co., 141 Chambers street, 5 horse-power elevators; Gold & Stock Tel. Co., 16 & 18 Broad street, 5 horse-power transmitters; Thurber, Whyland & Co., 143 Chambers street, 3 horse-power printing presses; Whitelaw Reid, Editor *Tribune*, 2 horse-power pumps, etc.

A Merited Holiday for a Company of Printers.

The James Kempster Printing Company, of 56 Cedar street, New York, comprises a staff of about 80 men, every one an artist. This company does more fine printing for electrical people and companies than any other printing house in the city, and does it always to the satisfaction of their patrons.

On Saturday last the entire staff enjoyed a holiday at College Point, L. I., traveling from Cedar street in handsome coaches and passing up Park Row in front of the REVIEW office, where they saluted. The day was greatly enjoyed by all the boys, the youngest and happiest of them all being Proprietor Kempster and his able foreman, Lieutenant-Colonel Driscoll.

OUR BOSTON LETTER.

(Special Correspondence.)

The use of electricity for lighting purposes is meeting with great favor at the summer resorts in the neighborhood of Boston. The Point of Pines has just been supplied with 80 arc lights which, it is said, will illuminate the grounds with a brilliancy heretofore unequalled at any New England sea shore resort.

Manager Folsom, of Oak Island-by-the-sea, has completed his private electric plant of 33 arc lights, each of 1,200 candle power for lighting the grove, and the station is now in full running order, illuminating the grounds to the perfect satisfaction of the management and patrons.

The North Shore Electric Company has had a gang of men at work setting poles and stringing wires from the Point of Pines to the Ocean Pier to connect with the large electric station which is being erected at Beachmont. The company will furnish the hotels with both arc and incandescent lights. Until the new station is finished, the current for the lights will be furnished by the old station at Crescent Beach.

The electric railway which has been building from Revere street to the post-office block at Crescent Beach has been extended to the Ocean Pier during the past week. The cars for the railway are expected in a few days.

The Harvard College yard on class day was very brilliantly illuminated by about fifteen arc lights with globes of various colors. This was a delightful innovation showing off with splendid effect the great variety of beautiful costumes worn by the ladies, and being a decided improvement over the Japanese lanterns of previous years. A large number of Weston 16 candle power incandescent lamps were arranged with great taste in different parts of the grounds, the most striking design being that hung in front of Holworthy and consisting of some 80 incandescents entwined with flowers and so arranged as to form the class numerals, '88, and beneath which hung a beautiful basket of flowers whose colors were rendered resplendent with a score of lights.

The application of the three wire system with storage batteries is being used in Roxbury by Mr. Herbert C. Wirt. His station is located at the factory of L. Prang & Company, Boston Highlands, where a 50 horse-power engine drives a 10 arc light Weston dynamo of an old pattern furnishing the current for the charging of 108 cells of the Accumulator Company of this city. The cells are connected upon the three wire system and run 100 Edison 16 candle power 100 volt lamps distributed in seven stores and one private house in the neighborhood, and they also furnish current for a one-half horse-power Sprague motor running a coffee mill. Mr. Wirt is increasing his list of customers and expects soon to establish a new central station upon a larger scale.

The Welsbach Incandescent Gas Light Company has opened an elegant office at 143 Tremont street in this city. In the rear of the business office is a spacious apartment which is subdivided into a suite of rooms elegantly furnished, and lighted with the Welsbach system.

On the evening of June 23d, a terrific electric storm passed over New England, and lightning struck the cut-out box on the outside of the Cambridge electric lighting station, disabling the main street circuit. In another place the insulation caught fire, and was burned off for a considerable distance. Linemen were put immediately at work, and in an hour the lights were again running. The day was the hottest in Boston in eighteen years, the thermometer reaching 98 degrees in the shade, and the lightning storm was, while it lasted, one of the sharpest seen in this vicinity for many a day.

At a town meeting held in Lexington, June 19th, permission was granted the Woburn Electric Light Company to establish a plant in Lexington, provided the gas company shall not see fit to satisfactorily demonstrate their willingness to take steps toward a similar measure.

The West End Railway Company has petitioned the Brookline selectmen for the right to construct and maintain an electric railroad in Brookline.

The Sprague Motor Company, through its New England agents, Messrs. Blake & Sawyer, have taken the contract for installing a 10 horse-power motor to pump water to the Suffolk Brewery from a well at a distance. The current will be furnished on a pole line from a 100-light Edison dynamo. This is quite a new application of the electrical transmission of energy in this vicinity. They will also install a 115-light Edison dynamo for lighting the brewery. The Sprague Company is also putting in motors at the following places in this city: Abram Trench & Co., a 10 horse-power motor to run elevator; at Alles & Fisher, cigar manufacturers, a one horse-power motor; and the Kelloway printing office, and the Notman Photo-Company are being supplied with Sprague motors.

The Eco Magneto Company, of this city, is putting in one of their watchman's clocks at Hotel Beacon, and in the new hotel which is being built for George F. Mellen at Fall River, Mass.

The work of laying the new government submarine cable in Vineyard Sound will begin to-morrow and will be superintended by Lieutenant W. D. Wright, U. S. service. It is probable that the Western Union Company will soon lay the single cable between Woods Holl and West Hop, in which case, the commission with the Vineyard will be excellent. The Pasque Island Club of New York will make telephone connection with the cable at Pasque.

Mr. Giles Taintor, who has been during the past year with the Electrical Accumulator Company in New York and Canada, was found enjoying the merry making at Harvard on class day, with the many friends he has made in Boston. He has left the service of the Accumulator Company to accept a more lucrative position as superintendent of the telephone exchange in his native town, Keene, N. H., and will enter upon the duties of his new position Monday, June 25th.

Boston, June 24th, 1880. L. A. F.

The American Electric Manufacturing Company.

The above company held its adjourned annual meeting last Friday, and there was developed a unanimity of feeling among the stockholders favorable to the company that has placed it on, it is said, a surer basis than when it first started out. The company on the patents which it holds alone, has spent in developing them a very large sum, and during the interim which has existed when the company was coping with difficulties that had unexpectedly presented themselves, we are informed that orders aggregating more than $100,000 had been received.

The stockholders, it is announced, are willing to put up not only money sufficient to meet the emergencies thrust upon them, but to advance such sums as will enable the company to even more vigorously prosecute its work. The election of officers resulted in the choice of a very strong board.

They are R. N. Hazard, of American Loan and Trust Company, New York; Levi M. Bates, of L. M. Bates & Co., New York; H. S. Hyde, President Agawam National Bank, Springfield, Mass.; J. H. Bidwell, of H. S. Collins & Co., bankers, Collinsville, Ct., J. W. Hinkley, Poughkeepsie, N. Y.; L. J. Fitzgerald, State Treasurer, Cortland, N. Y.; A. R. Brown, manager Electrical Development and Manufacturing Company, Boston; E. D. Jones, State Senator, Pittsfield, Mass.; W. H. Roberson, of Messrs. R. G. Dun & Co., Albany, N. Y.; David Prouty, capitalist, Spencer, Mass.; H. C. Adams, late treasurer American Company, New York; William J. Osborne, broker, New York; Edwards H. Goff, New York. Mr. R. N. Hazard was afterwards elected president, and F. M. Sowden secretary and treasurer, of the company.

We are in receipt of James W. Queen & Co.'s new catalogue and price list of electrical testing apparatus. All of the standard instruments for electrical testing and measuring are contained in Messrs. Queen & Co.'s stock, and are clearly illustrated. In the matter of direct reading current and pressure meters, the line is very full, and is calculated to suit any requirement. We advise all our readers to send to Messrs. Queen & Co., Philadelphia, for their new catalogue.

Dallas, Tex.—The Queen City Electric Light Company. Capital stock, $100,000. The incorporators are: Owen J. Cook, G. P. Hopkins and J. P. Davidson. The purpose of the company is to furnish arc and incandescent light in Dallas and elsewhere.

Chicago, Ill.—The Sprague Equipment Company, capital, $50,000; to furnish electric equipment for the propulsion of cars on street, elevated and general railway systems. Incorporators: William H. Fairclough, J. L. Barclay and H. Bavin.

Detroit, Mich.—The Hicks Induction Light and Motor Company, capital stock, $400,000, all paid in, will manufacture and sell electric apparatus for generating and applying electricity for all purposes. The capital stock is divided into 16,000 shares, and is held by Thomas H. Hicks, 2,200; E. D. Richmond, 2,200; Peter Duffee, 2,200; Homer Pennock, 1; Solin Johnson, 319; J. E. Guilbault, 960; J. E. Lockwood, 2,200; David Pennock, 960; Charles H. Lee, 960; all of Detroit.

General Comment.

Now that electricity has been adopted by the State of New York, as the means of destroying the lives of condemned criminals, the best and surest method of adopting the electric current to this use is being generally discussed. It is very probable that the first execution under this law, which goes into effect January 1st, 1889, will be very widely illustrated and described—a consummation that the law particularly opposes.

A leaking gas pipe on Sixth avenue, New York, let gas into the electrical subway. From that subway it escaped into a pipe used to conduct the wires up a telegraph pole. Half way up the pole there was a hole in this pipe, and the gas was forced out against the wood of the pole. Sunday the heat of the sun set the gas-filled wood on fire, and it required the services of the fire men with a portable engine to extinguish the flames. This is the story as reported in the daily press, and either indicates excellent reportorial talent or a hot day.

The first anniversary of the Boston Club, as described elsewhere, was a very successful and enjoyable event, and reflected honor upon the Club and its excellent management.

An interesting electrical scheme is announced for proposals from Sullivan Harbor, Me. The water power is to be used for generating electricity, which in connection with storage batteries and motors is to light the cottages and hotels and furnish power at all adjacent points.

The number of applications for patents on electrical appliances is phenomenal. During the week ending May 29, seventy-three patents were issued from the Patent Office. A general subdivision into various recognized departments is interesting, as showing those in which inventors are most busily engaged: There are 14 patents relating to instruments and devices of measurement and testing, 2 to telegraphy, 2 to the telephone, 3 directly to the motor, 4 directly to the galvanic battery, 4 directly to the secondary battery, 1 to a thermo-electric generator, 26 to dynamos and electric light apparatus, and the transmission and distribution of electricity for purposes of light and power, 17 to miscellaneous applications. Among those relating to electric light apparatus are quite a number covering a whole alternating current system.

Mr. William Cullen Bryant is superintendent of the electric light station at Waterbury, Conn. The station is well managed, and furnishes electric current for about 250 arcs and 1,000 incandescent.

An English Opinion of the Tesla Motor.

In our issue of the 18th May, we gave an account of a very interesting investigation made by Professor Galiles Ferraris, of Turin, which had for its object the production of mechanical rotation by the electro-dynamic action of alternating currents. The fundamental principle of the apparatus devised by Ferraris, is a revolving resultant magnetic field produced by two coils, which carry alternating currents, and the axes of which are at right angles to each other. We said in our account of this investigation, that this principle may be applied in the construction of electricity meters to be used on an alternate current supply system, and possibly also in that of motors; though on this point we would not prophesy. It is significant of the enterprise and inventive skill of American electricians, that at the time these lines were being printed, Mr. Nicola Tesla brought before the American Institute of Electrical Engineers an actual solution of the problem which we on this side of the Atlantic merely foreshadowed as possible at some future time. The solution may, perhaps, not be perfect in its present form; but as far as it goes, it is a long step in the direction of applying alternating currents for motive power purposes, and as such it will be appreciated by those of our readers who are interested in the distribution of electricity from central stations. Owing to the importance of the subject, we give herewith Mr. Tesla's paper in full.—*London Industries.*

An Electric Speed Recorder.

BY GEO. H. BARRUS, BOSTON, MASS.

In a paper read by Mr. W. R. Eckart, at the Philadelphia Meeting, a description was given of an instrument for recording speed, which was constructed on the principle of the chronograph. Recent experiments of the writer on the regulating qualities of certain steam-engine governors, required the use of an instrument of similar character, and an apparatus was arranged for the purpose on the following plan:

The apparatus consists essentially of an instrument similar to a Morse telegraph register, in which there are two recording pens, each worked independently by an electro-magnet. The record is made on a paper ribbon, which is moved by clockwork, at a speed of about two and one-half feet per minute. The magnets are operated by the alternate making and breaking of the electric circuits in which they are placed. In one case the circuit is made and broken by the oscillating movement of the escapement wheel of a clock, and this occurs 120 times per minute, or once in a half second. In the other it is done by the revolution of the engine shaft, which is arranged so that during half of the revolution the two ends of the circuit are in contact, while during the remaining half the circuit is broken. The records consist of two lines of short indentations or dashes, made in the paper ribbon, and these lines are parallel to each other and five-eighths of an inch apart. The time record is made up of dashes about one-eighth of an inch long and one-eighth of an inch apart; that is, about one-quarter of an inch from center to center. The dashes making up the speed record are about one-sixteenth of an inch long, and, in the case under consideration, about half as far apart as those of the time record. A sample of one of the records is reproduced in the following copy:

The number of revolutions which take place during any desired period of time is determined by drawing perpendicular lines through the centers of those dashes which mark the beginning and end of the interval, and counting the number of speed dashes and fractions which lie between these lines. The record appears to be reliable to as small a fraction of revolution as one-tenth.

This instrument operated satisfactorily at a speed of 300 revolutions per minute. To show the utility of such an instrument, the record of one test is appended, which was made to determine the rapidity with which the governor operated when the engine was first attaining its normal speed, starting from a state of rest, the throttle valve being wide open, and the engine carrying simply a friction load. The first part of the record shows the indications made when the engine was working at normal speed. The throttle valve was then closed for a time to allow the speed to become reduced; then it was opened wide and the governor allowed to take control. The record shows the number of revolutions made for intervals of two seconds during all this time.

Time.	Number of revolutions indicated by recorder.	Difference for 2 seconds.	Remarks.
4.18.55	802.4		
19.05	845.9	Av.8.7	
15	889.4	Av.8.7	Throttle shut at [4.19.15
25	926.2	Av.7.36	
27	932.2	6.	
29	937.7	5.5	
31	942.7	5.	At 4.19.30 [throttle wide open
33	948.8	6.1	
35	956.2	7.4	
37	965.	8.8	
39	973.7	8.7	
41	982.5	8.8	
43	991.3	8.8	
45	1000.	8.7	
47	1008.6	8.6	
49	1017.3	8.7	
51	1026.1	8.8	
53	1034.6	8.5	
55	1043.4	8.8	

A Simple Electroscope.

In examining the dry film of collodion, Prof. Jouravski has found that it can be electrified negatively with great facility. It is sufficient to rub it slightly between the fingers. As it is extremely thin, it will approach objects electrified positively, and repelled from those negatively electrified. In this way, with a strip of collodion film, the polarity of electrified objects can be readily verified. To prepare the film the collodion is poured on a glass of water, and after the ether is evaporated, the film which remains can be easily removed and cut into long, straight strips, each of which constitutes a perfect electroscope. These bands should be kept in an obscure place. The author mentions these facts with the idea that such a simple and ready electroscope may be very useful to physicists.—*Russian Physico-Chemical Journal.*

—— Mr. Tishner of San Francisco, Cal., will build an electric railroad in Sacramento.

—— The Colfax Electric Light Company of Colfax, W. T., will use the Edison system.

—— Lightning burned out the apparatus of the Portland, Oregon, Electric Light Company to the extent of $1,000.

—— H. J. Edwards' Electrical Improvement Company in San Jose, Cal., is putting up poles and wires for lighting and furnishing power.

—— Mr. W. J. Hammer of the Edison Company, is greatly pleasing the Cincinnati Exposition people with his artistic work in electric lighting.

—— Charles C. Hoyt has resigned the presidency of the Electric light and power company, Greenfield, Mass., and Henry W. Warner has been elected in his place.

—— A. H. Emery, F. H. Ball, F. D. Vanderlip, J. M. Cory, G. G. Hutchinson and F. E. Tadlock of San Francisco, Cal., have petitioned the Fresno trustees for an electric light franchise.

—— The Interstate Electric Company of Kansas City, Mo., Paul W. Bossart, general superintendent, is doing an extensive business with Faure accumulators in the west. A new central station is being put in by this company at Missouri Valley, Iowa, which is to be in operation early in July.

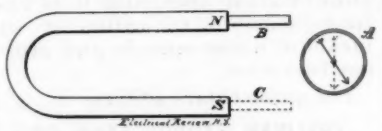
A Method of Indicating the Magnetic Change Caused by Heat.

TO THE EDITOR OF ELECTRICAL REVIEW:

Having been engaged in the study of the remarkable magnetic change which occurs in iron at a red heat, I devised the following plan for indicating this change by the motion of a balanced magnetic needle:

If a piece of magnetic metal is heated to a point above that at which it loses its capacity for magnetic induction, and is placed near one end of a balanced magnetic needle, it will attract the needle when it cools to the point at which it regains its magnetic property; but this gives no indication of the rate of the increase of magnetic power, for, as the motive power is the magnetism of the needle, as soon as it has started it moves with increasing force.

It is manifest that if a compass, *A*, is placed in front of a horseshoe magnet, and a piece



of iron, *B*, is placed on one of the poles, the needle will assume the position shown. If a piece of red hot iron, *C*, is placed on the other pole it will be seen that, as it cools, the needle will change to the new position shown by the dotted lines, so that it will be adapted to the altered magnetic field produced by the advent of the magnetic body, *C*; and the rapidity of this movement will be dependent upon the rate of cooling.

It is not necessary that *C* should be the same size as *B*, for by placing the compass near the smaller one the same deflection may be secured.

WM. B. COOPER,
517 Locust street,
June 18th, 1888. Philadelphia, Pa.

Cowles Laboratory Burned.

The office and laboratory of the Cowles Electric Aluminum Works, in Lockport, N. Y., in a building detached from the smelting works, were burned with such rapidity that nothing was saved. Loss, $3,500. Insurance, $2,000.

—— The Louisiana Electric Light Company have laid a cable across the Mississippi river to light Algiers, Gretna and Freetown, by electric light.

—— The electric lights which have been placed in Druid Hill Park, Baltimore, were turned on last week for the first time, and the effect was fine. The lights extend from Madison avenue entrance to the Mansion House, and placed at intervals of about 100 yards. The lights when turned on drew crowds of visitors to the park who promenaded about enjoying the novelty of the occasion and also the beauty of the surroundings.

—— The illuminating power of the new Princess Anne Hotel, Virginia Beach, said to be the model southern hotel, is composed of the Brush electric light, and consists of a Ball engine of 80 horse-power, with boiler of same capacity, running three dynamos, two for the incandescent lights, with standard capacity; the largest dynamo is for the arc lights. These dynamos control 350 incandescent lights, each with 16 candle-power, and 15 arc lights, each with a power of 1,200 candles. The lights are controlled by sections from the power room, and any circuit can be cut off at will, inside or outside the house. The whole plant has been put in under the superintendent of construction of the Brush Light Company, Mr. Alex. Henderson, an electrician and mechanic of ability and experience, as his work attests. The Ball engine which runs the dynamos was manufactured by the Ball Engine Company, of Erie, Pa., and is noiseless, and as clean as a clock, being lubricated by patent oil cups of the latest and most approved style. Mr. Parmlee, electrician and engineer of the Brush Company, will have charge of the plant until it runs smooth and the local engineer is initiated into the art and mysteries of its work.

ELECTRIC LIGHT NEWS

—— Trinidad, Col., is now happy over its new electric light.

—— The Norfolk, Va., Gas Light Company will erect an electric light plant.

—— J. M. Porter will put up an incandescent electric light plant at Owensboro, Ky.

—— The Portsmouth, Va., City Council contemplate having an electric light plant erected.

—— J. B. Friedham is organizing a stock company to erect an electric light plant at Camden, Ark.

—— Port Deposit, Md., will have an electric light plant soon; John M. McClenahan has the matter in charge.

—— The City Railway Company, of Richmond, Va., have asked for a permit to run their cars by electricity.

—— Childs & Macmurdo, of Richmond, Va., have secured a permit to erect an electric light plant in Lynchburg.

—— The Sheffield, Ala., Electric Light Company will enlarge and will expend about $10,000 for additional machinery.

—— F. C. Peck of Lowell, Mass., has the contract for making changes in the system of incandescent lighting in Milford, Mass.

—— Winthrop, Mass, will be lighted by electricity. The North Shore Electric Light Company has the contract and the current will be turned on by July 1st.

—— At Newport, R. I., the electric light companies' charters were not granted at the General Assembly, so both companies will string their wires on private property. One had prepared to put its wires underground, but without a charter that could not be done.

—— The Syracuse, N. Y., Electric Light and Power Company, when the changes that are now in progress are completed, will have one of the best systems in the state. Their incandescent business is rapidly increasing, and among the latest installations is the new Leland Hotel.

—— In Brooklyn, the Edison Light Company has sent to the city council a duplicate copy of an application for a franchise, together with a copy of the articles of incorporation, which were communicated to the board October 29, 1887. It was referred to the Committee on Lamps and Gas.

—— A secondary battery has been patented by Mr. Ludwig Epstein, of Martiniken felde, near Berlin, Germany. This invention covers a method of preparing powdered lead for electrodes, consisting in adding sulphate of lead to molten metallic lead, and stirring the liquid mass until it has been transformed into a finely-divided powder, with other usual features.

—— An interesting little central station installation is at work, says the *Bulletin de l'Electricité*, at Mende, in France. The installation was carried out by M. Lamy, who has established several other central stations in different county towns in France—Chateaulin and others. A continuous current is used at a pressure of 100 volts to supply Khotinsky incandescent lamps to a maximum distance of 850 meters (900 yards). The streets, boulevards, town halls, etc., are all lighted, and the hotels will shortly receive the supply. Engine-power is furnished for the evening lighting, that is, from dusk to midnight, by two 120 horse-power compound engines, driving direct at 120 revolutions, a Thuiry dynamo giving 800 amperes. The steam is supplied by Babcock & Wilcox multitubular boilers. These are stopped at midnight, and the night service is continued by accumulators charged during the day by a Gramme dynamo; this is driven by a separate 10 horse-power high-speed steam engine, and gives 40 amperes and 150 volts.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 19, 1888.

384,638 Dynamo electric machine; Robert Oliver, Alpena, Mich.

384,644 Multiple switchboard testing apparatus; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place.

384,645 Magnetic separator; M. Holroyd Smith, Halifax, County of York, England.

384,660 Shell. 484,661 Shell for high explosives.

384,662 Magneto-electric fuse. 384,663 Projectile.

384,664 Shell fuse; Edmund L. Zalinski, U. S. Army.

384,676 Automatic electric gas cut out for railroad cars; Frederick C. Brower, Syracuse, N. Y.

384,685 Electric railway; Stephen D. Field, Yonkers, N. Y.

384,775 Electro-magnetic parcel carrier; Morris C. Mengis, New York, N. Y.

384,796 Electric gas lighting device and gas cock; William Tag and Sanford C. Smith, Philadelphia, Pa.

384,810 Automatic electric block signal system.

384,811 Apparatus for operating automatic block signals; Thomas D. Williams, Allegheny City, and John S. Lucock, Bellevue, assignors of three fifths to James W. Clark, George M. Eitemiller, and Geo. Morris, all of Allegheny, County, Pa.

384,815 Incandescent lamp socket and switch.

384,816 Commutator for dynamo electric machines.

384,817 Electric arc lamp; James J. Wood, Brooklyn, N. Y.

384,830 Railway signaling; Thomas A. Edison, Llewellyn Park, N. J., and Ezra T. Gilliland, New York, N. Y.

384,856 Electro-magnetic time lock; Charles J. Kintner, New York, N. Y.

384,875 Electric fire alarm apparatus; George M. Stevens, Cambridge, Mass.

384,901 Guard rail and insulator for electric railways; Horatio A. Foster, Boston, Mass.

384,910, 384,908, 384,911, 384,912 Electric railway; Rudolph M. Hunter, Philadelphia, Pa.

384,909 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Electric Car Company of America, same place.

384,934 Electric stopping mechanism for looms; John Rush and Edwin Oldfield, Norwich, Conn.

384,948 Conduit for underground pipes; Thomas J. Young, Boston, Mass., assignor, by mesne assignments, to himself, C. L. Perrin, and Mark Wilmarth, all of same place.

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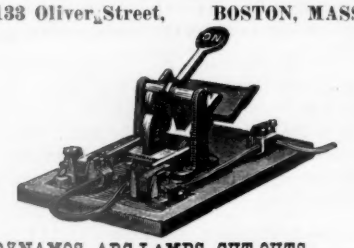

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